



Products for DNA Research

2025 Catalog

glenresearch.com

 **GLEN**
RESEARCH
part of Maravai LifeSciences



Oligo synthesis success. The first time and every time.

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STERLING

BACKBONE MODIFIERS

MINOR BASES

MODIFICATION/LABELING

RNA AND 2'-OMe-RNA
MISCELLANEOUS

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STERLING

BACKBONE MODIFIERS

MINOR BASES

MODIFICATION/LABELING

RNA AND 2'-OME-RNA

MISCELLANEOUS

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ABOUT US

Glen Research develops, manufactures and markets reagents for oligonucleotide synthesis, modification, labeling and purification. The company serves customers worldwide involved in basic research, diagnostics and therapeutics. Although Glen Research's original mission was to provide state-of-the-art reagents to researchers, the company also began offering standard reagents for oligonucleotide synthesis but with the innovation that every batch was accompanied by a Certificate of Analysis. The analytical techniques and quality criteria used for the evaluation and acceptance of these reagents were to become an industry standard years later. The company is headquartered in Sterling, Virginia. A privately held company, Glen Research was acquired by Maravai LifeSciences in December 2017.

OVER 30 YEARS OF ASSURED QUALITY FOR OLIGO SYNTHESIS

| | |
|--|--|
| <p>1987</p> <p>Glen Research was incorporated in the Commonwealth of Virginia</p> | |
| <p>1993</p> <p>Glen Research introduced the Sterling line of products, a new standard of quality for oligonucleotide synthesis</p> | <p>1991</p> <p>Company awarded SBIR grant for the investigation of large scale oligonucleotide synthesis using H-phosphonate chemistry</p> |
| <p>1996</p> <p>Company negotiated an exclusive license with Gilead Sciences to supply C5-propynyl pyrimidine nucleosides and G-Clamp phosphoramidites</p> | <p>1995</p> <p>Glen Research negotiated an exclusive agreement to supply 5'-biotin phosphoramidite worldwide</p> |
| <p>1999</p> <p>Company awarded patents for a chemical phosphorylation reagent compatible with DMT-ON purification</p> | <p>1997</p> <p>Glen Research moves into a custom built building in Sterling, Virginia</p> |
| <p>2003</p> <p>Glen Research negotiated an agreement with GE Healthcare Biosciences Corp. to supply Cyanine Dyes to the research market</p> | <p>2002</p> <p>Company made an agreement with Epoch Biosciences, Inc. to supply their proprietary dyes and nucleosides to the research market</p> |
| <p>2006</p> <p>In collaboration with Berry & Associates, Inc., Glen Research awarded patents for pyrrolo-C analogues (fluorescent C analogues).</p> | <p>2004</p> <p>Company awarded patents for a truly universal support for oligonucleotide synthesis - US III.</p> |
| <p>2013</p> <p>In collaboration with Nelson Biotechnologies, Inc., company awarded patent for serinol phosphoramidites and supports</p> | <p>2008</p> <p>Glen Research obtained a license for the sale of Glen UnySupport from Ionis Pharmaceuticals</p> |
| <p>2019</p> <p>Glen Research receives its ISO 9001:2015 certification for Quality Management Systems</p> | <p>2017</p> <p>Glen Research is acquired by Maravai LifeSciences</p> |

CATALOG

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

Welcome to the Glen Research Catalog containing the most complete selection of products for DNA and RNA research. The Table of Contents at the beginning and the Index at the end of the Catalog are the most comprehensive we have produced. There are always limitations to printed catalogs in a fast-moving technology sector and a complete and up-to-date catalog is also maintained on our web site.

All minor bases, modifiers and RNA products are packaged for Applied Biosystems instruments. We can provide vials and columns for a wide variety of other instruments. As shown in the table to the left, we can accommodate catalog numbers for unusual products to fit all popular instruments. The table to the left is reproduced on all relevant spreads of this catalog.

We are unique in conducting a QC test for supports to show the length of oligo that can be prepared before a drop-off in coupling due to steric effects begins to occur. The drop-off point is recorded in the Certificate of Analysis or Analytical Report. Unless otherwise specified, our minor base and modification supports are 1000Å CPG, which results in improved performance and the ability to make much longer oligos. Polystyrene supports are also available for some of our most popular items.

For reasons of quality assurance, we do not transfer powders or oils from stock Applied Biosystems vials to vials for other instruments. Powders may be hygroscopic and electrostatic, making transfer difficult, and oils have to be dissolved and the solvent evaporated. For best performance, it is preferable for the customer to dissolve the product and immediately transfer the solution to the correct instrument vial. Consequently, the product will be delivered in an industry-standard septum-capped vial along with a clean dry vial for the appropriate instrument.

Glen Research will only guarantee products purchased through our official distributors. A complete listing of authorized distributors can be found on our website at: <https://www.glenresearch.com/international-distributors>.

QUALITY AND PERFORMANCE ASSURED

Glen Research has developed and implemented a Quality Management System (QMS) designed to enhance customer satisfaction by focusing on processes for continual improvement and on assurance of conformity to customer needs, with full consideration of applicable regulatory requirements.

STERLING QUALITY

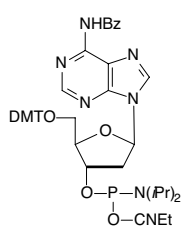
The benchmark for excellence in DNA and RNA synthesis. All Sterling materials must pass stringent purity and identity tests prior to acceptance. Sterling products are formulated, filtered, and packaged in optimal environments using specially cleaned and dried glassware and columns. Color-coded labeling and post-packaging analysis guarantee accuracy and Sterling Quality.



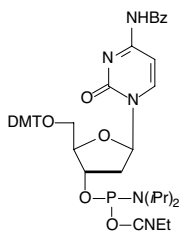
STERLING is a trademark of Glen Research.

Glen Research offers the highest level of Quality Assurance for reagents for DNA and RNA synthesis - Sterling Quality and Performance. We now apply the Sterling criteria of quality and performance to all of Glen Research's established products.

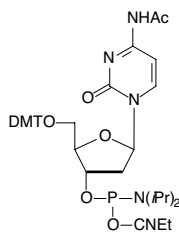
The common monomers and supports, whose structures are illustrated below, are available for the variety of synthesizers listed on the following pages.



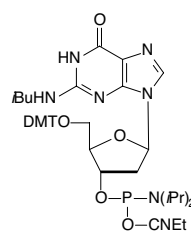
dA-CE Phosphoramidite



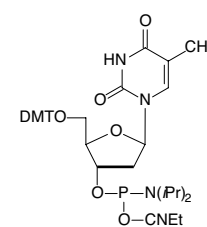
dC-CE Phosphoramidite



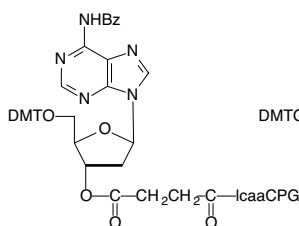
Ac-dC-CE Phosphoramidite



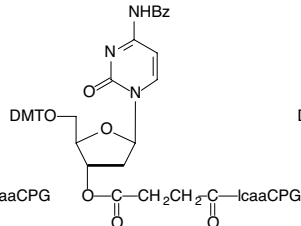
dG-CE Phosphoramidite



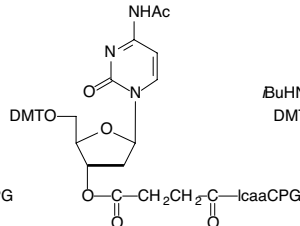
dT-CE Phosphoramidite



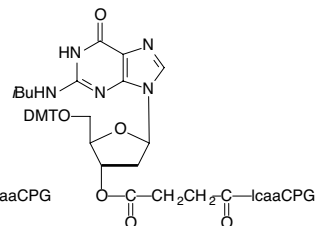
dA-Icaa-CPG



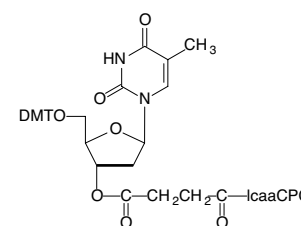
dC-Icaa-CPG



Ac-dC-Icaa-CPG



dG-Icaa-CPG



dT-Icaa-CPG

STERLING PERFORMANCE

The standard of accomplishment for DNA and RNA synthesis. Every batch of Sterling reagents is analyzed by titration to confirm exact formulation. Every batch of Sterling monomers, supports and activators is synthesis-tested to ensure optimal performance. Certificates of Analysis provide your guarantee of Sterling Performance.



STERLING

STERLING CE PHOSPHORAMIDITES

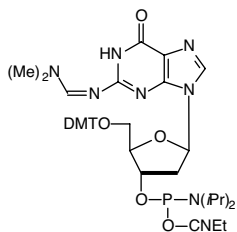
Glen Research CE (β -cyanoethyl) Phosphoramidites are produced and packaged to ensure the highest performance on DNA synthesizers. Every Glen Research product is accompanied by a Certificate of Analysis and HPLC trace, showing the results of our QC testing. Every Glen Research monomer vial is specially cleaned to eliminate particulate contamination, and each vial type is thoroughly tested or inspected to ensure a tight fit on synthesizers.

QUALITY ASSURANCE

Every batch of these CE

Phosphoramidites is tested as follows:

- 1. HPLC**
a) Identity is confirmed by comparison with a reference sample.
b) Purity is determined by HPLC to be $\geq 98.0\%$.
- 2. TLC**
Purity is verified by TLC.
- 3. ^{31}P NMR**
Purity is determined by ^{31}P NMR to be $\geq 98\%$.
- 4. Coupling Test**
Coupling efficiency is determined to be $\geq 99\%$.
- 5. Solution Test**
A 0.1M solution is determined to be clear and free of particulate contamination.
- 6. Loss on Drying**
Volatile contaminants are determined to be $\leq 2\%$.



dmf-dG-CE Phosphoramidite

ABI INSTRUMENTS

1. 60mL septum-capped vials used on oldest ABI 380, 381 and 391 instruments. 200mL oxidizer and 450mL deblock screw-capped bottles also used on ABI 380, 381 and 391 instruments.
2. Small screw-capped vials used on ABI 392 and 394 instruments.
3. Larger screw-capped vials used on ABI 392, 394 and 3400 instruments.
4. Large bottles used on ABI 3900 instruments.

RELATED

Depurination Resistant dA26

| Item | Catalog No. | Pack |
|---------------------------|-------------|-------|
| dA-CE Phosphoramidite | 10-1000-02 | 0.25g |
| | 10-1000-05 | 0.5g |
| | 10-1000-10 | 1.0g |
| | 10-1000-20 | 2.0g |
| | 10-1000-40 | 4.0g |
| dC-CE Phosphoramidite | 10-1010-02 | 0.25g |
| | 10-1010-05 | 0.5g |
| | 10-1010-10 | 1.0g |
| | 10-1010-20 | 2.0g |
| | 10-1010-40 | 4.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-02 | 0.25g |
| | 10-1015-05 | 0.5g |
| | 10-1015-10 | 1.0g |
| | 10-1015-20 | 2.0g |
| | 10-1015-40 | 4.0g |
| dG-CE Phosphoramidite | 10-1020-02 | 0.25g |
| | 10-1020-05 | 0.5g |
| | 10-1020-10 | 1.0g |
| | 10-1020-20 | 2.0g |
| | 10-1020-40 | 4.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-02 | 0.25g |
| | 10-1029-05 | 0.5g |
| | 10-1029-10 | 1.0g |
| | 10-1029-20 | 2.0g |
| | 10-1029-40 | 4.0g |
| dT-CE Phosphoramidite | 10-1030-02 | 0.25g |
| | 10-1030-05 | 0.5g |
| | 10-1030-10 | 1.0g |
| | 10-1030-20 | 2.0g |
| | 10-1030-40 | 4.0g |

STERLING SOLVENTS/REAGENTS

All solvents and reagents are prepared to our exacting specifications to ensure the highest synthesis efficiency and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination. Glen Research uses freshly sublimed 1H-tetrazole for premium performance on Applied Biosystems synthesizers.

| Item | Catalog No. | Pack |
|---|-------------------------|--------|
| <i>Activator</i> Tetrazole in Acetonitrile | 30-3100-45 ¹ | 45mL |
| | 30-3100-52 ² | 200mL |
| | 30-3100-57 ³ | 450mL |
| | 30-3100-62 ⁴ | 2000mL |
| <i>Diluent</i> Acetonitrile, anhydrous | 40-4050-45 | 60mL |
| | 40-4050-50 | 100mL |

STERLING CE PHOSPHoramidites (CONT.)

| Item | Catalog No. | Pack |
|---|---------------------------|--------|
| <i>Cap Mix A</i> Tetrahydrofuran/Pyridine/Acetic Anhydride | 40-4110-52 ² | 200mL |
| | 40-4110-57 ³ | 450mL |
| | 40-4110-62 ⁴ | 2000mL |
| <i>Cap Mix B</i> 16% 1-Methylimidazole in Tetrahydrofuran (This Cap B solution is identical to the formulation produced by Applied Biosystems.) | 40-4220-52 ² | 200mL |
| | 40-4220-62 ⁴ | 2000mL |
| <i>Oxidizing Solution</i> 0.02M Iodine in Tetrahydrofuran/Pyridine/Water | 40-4330-52 ^{1,2} | 200mL |
| | 40-4330-57 ³ | 450mL |
| | 40-4330-62 ⁴ | 2000mL |
| <i>Deblocking Mix</i> 3% Trichloroacetic Acid/Dichloromethane | 40-4140-57 ^{1,2} | 450mL |
| | 40-4140-62 ^{3,4} | 2000mL |

STERLING SUPPORTS

All Glen Research CPG supports use the standard long chain alkylamino (lcaa) linker but differ in the glass pore size, 500Å, 1000Å or 2000Å. The 500Å support is appropriate for shorter sequences, while the 1000Å supports perform better in the synthesis of longer (>30-mer) DNA sequences. The 2000Å support is best for very long (>150-mer) oligonucleotides. We have instituted an additional QC test for supports to show the length of oligo that can be prepared before a drop-off in coupling due to steric effects begins to occur. The drop-off point is recorded in the Certificate of Analysis. All Glen Research supports are fully end-capped to ensure that the CPG surface is totally inert, thereby avoiding the introduction of impurity sequences containing deletions at the 3'-terminus.

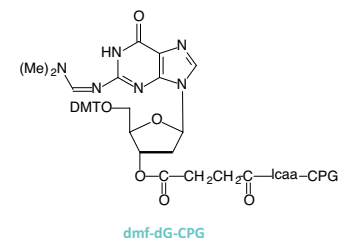
| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|---------|
| dA | dC | dG | dT | dA,dC,dG,dT | Ac-dC | d m f - d G | |
| (1 column of each base) | | | | | | | |
| <i>500Å Columns</i> | | | | | | | |
| 20-2100-42 | 20-2110-42 | 20-2120-42 | 20-2130-42 | 20-2140-42 | 20-2113-42 | | 4x0.2µm |
| 20-2100-41 | 20-2110-41 | 20-2120-41 | 20-2130-41 | 20-2140-41 | 20-2113-41 | | 4x1.0µm |
| 20-2100-13 | 20-2110-13 | 20-2120-13 | 20-2130-13 | | 20-2113-13 | | 1x10µm |
| <i>1000Å Columns</i> | | | | | | | |
| 20-2101-45 | 20-2111-45 | 20-2121-45 | 20-2131-45 | 20-2141-45 | 20-2115-45 | 20-2129-45 | 4x40nm |
| 20-2101-42 | 20-2111-42 | 20-2121-42 | 20-2131-42 | 20-2141-42 | 20-2115-42 | 20-2129-42 | 4x0.2µm |
| 20-2101-41 | 20-2111-41 | 20-2121-41 | 20-2131-41 | 20-2141-41 | 20-2115-41 | 20-2129-41 | 4x1.0µm |
| 20-2101-13 | 20-2111-13 | 20-2121-13 | 20-2131-13 | | 20-2115-13 | 20-2129-13 | 1x10µm |

ABBREVIATIONS

Ac₂O = Acetic Anhydride
 CE = Cyanoethyl
 CPG = Controlled Pore Glass
 DCM = Dichloromethane
 dmf = dimethylformamide
 I₂ = Iodine
 lcaa = long chain alkylamino
 MeIm = 1-Methylimidazole
 µm = micromole(s)
 nm = nanomole(s)
 TCA = Trichloroacetic Acid
 THF = Tetrahydrofuran

RELATED

Alternative Solvents..... 34



STERLING SUPPORTS (CONT.)

ABI 3900 1000Å CPG COLUMNS

Glen Research's ABI 3900 1000Å CPG columns bring the lower cost of CPG to this platform while maintaining the high synthesis efficiency of 1000Å CPG. Our columns offer the following key attributes:

- No need to change instrument settings
- No need to change software parameters
- Easier handling post-synthesis compared to PS
- High quality 1000Å CPG for optimal synthesis results

BULK CPG LOADING

| | |
|----------------|---------------|
| 500Å supports | 35-50µmoles/g |
| 1000Å supports | 25-40µmoles/g |

RELATED

| | |
|--------------------------|----|
| Universal Supports | 28 |
| Q-Supports..... | 31 |
| High Load Supports | 33 |

| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|--|-------------|-------------|-------------|-------------------------|-------------|-------------|-----------|
| dA | dC | dG | dT | dA,dC,dG,dT | Ac-dC | d m f - d G | |
| | | | | (1 column of each base) | | | |
| <i>2000Å Columns</i> | | | | | | | |
| 20-2102-42 | 20-2112-42 | 20-2122-42 | 20-2132-42 | 20-2142-42 | | | 4x0.2µm |
| <i>Low Volume (LV) Polystyrene Columns</i> | | | | | | | |
| 26-2100-45 | 26-2110-45 | 26-2120-45 | 26-2130-45 | 26-2140-45 | | | 4x40nm |
| 26-2100-42 | 26-2110-42 | 26-2120-42 | 26-2130-42 | 26-2140-42 | | | 4x0.2µm |
| <i>ABI 3900 Polystyrene Columns</i> | | | | | | | |
| 26-2600-65 | 26-2610-65 | | 26-2630-65 | | 26-2629-65 | | 200x40nm |
| 26-2600-62 | 26-2610-62 | | 26-2630-62 | | 26-2629-62 | | 200x200nm |
| <i>ABI 3900 1000Å CPG Columns</i> | | | | | | | |
| 20-2101-65 | | | 20-2131-65 | | 20-2115-65 | 20-2129-65 | 200x40nm |
| 20-2101-62 | | | 20-2131-62 | | 20-2115-62 | 20-2129-62 | 200x200nm |
| 20-2101-61 | | | 20-2131-61 | | 20-2115-61 | 20-2129-61 | 200x1.0µm |
| <i>500Å Bulk CPG</i> | | | | | | | |
| 20-2000-01 | 20-2010-01 | 20-2020-01 | 20-2030-01 | | 20-2013-01 | | 0.1g |
| 20-2000-02 | 20-2010-02 | 20-2020-02 | 20-2030-02 | | 20-2013-02 | | 0.25g |
| 20-2000-10 | 20-2010-10 | 20-2020-10 | 20-2030-10 | | 20-2013-10 | | 1.0g |
| <i>1000Å Bulk CPG</i> | | | | | | | |
| 20-2001-01 | 20-2011-01 | 20-2021-01 | 20-2031-01 | | 20-2015-01 | 20-2029-01 | 0.1g |
| 20-2001-02 | 20-2011-02 | 20-2021-02 | 20-2031-02 | | 20-2015-02 | 20-2029-02 | 0.25g |
| 20-2001-10 | 20-2011-10 | 20-2021-10 | 20-2031-10 | | 20-2015-10 | 20-2029-10 | 1.0g |
| <i>2000Å Bulk CPG</i> | | | | | | | |
| 20-2002-01 | 20-2012-01 | 20-2022-01 | 20-2032-01 | | | | 0.1g |
| 20-2002-02 | 20-2012-02 | 20-2022-02 | 20-2032-02 | | | | 0.25g |
| 20-2002-10 | 20-2012-10 | 20-2022-10 | 20-2032-10 | | | | 1.0g |

| Item | Catalog No. | Pack |
|--|-------------|------------|
| Empty Synthesis Columns-TWIST 40nm, 0.2µm or 1µm | 20-0030-00 | Pack of 10 |
| Empty Synthesis Columns - TWIST 10µm/15µm | 20-0040-00 | Pack of 10 |
| Replacement Frits - TWIST 10µm/15µm | 20-0040-0F | Pack of 20 |

TWIST is a trademark of Glen Research.

ABI 3900 POLYSTYRENE MODIFIER COLUMNS

Some of our more popular minor base and modifier supports are available on polystyrene in columns fully compatible with the Applied Biosystems 3900 synthesizer. These include our popular Universal Support III, which will allow DNA, RNA or LNA oligos to be produced on the 3900 with ANY base at the 3' terminus. At the same time, we are offering 1 μmole columns of Universal Support III for the 3900 instrument. Structures and more complete descriptions are found in the relevant catalog sections for each item. ABI 3900 columns can be prepared with virtually any of the CPG supports in this catalog. It is no longer necessary to adjust the flow using our ABI 3900 CPG columns, as noted in the box to the right. Modified CPG columns are only available in 200 nmole size - simple add 'A' to the regular catalog number to order.

| Item | Catalog No. | Pack |
|------------------------------------|-------------|------------|
| Universal Support III PS | | |
| 200 nmole columns | 26-5110-52 | Pack of 10 |
| 40 nmole columns (ABI 3900 Format) | 26-5110-55 | Pack of 10 |
| Glen UnySupport™ PS | | |
| 200 nmole columns | 26-5140-52 | Pack of 10 |
| 40 nmole columns | 26-5140-55 | Pack of 10 |
| 3'-Phosphate PS | | |
| 200 nmole columns | 26-2900-52 | Pack of 10 |
| 40 nmole columns | 26-2900-55 | Pack of 10 |
| 3'-PT-Amino-Modifier C6 PS | | |
| 200 nmole columns | 26-2956-52 | Pack of 10 |
| 40 nmole columns | 26-2956-55 | Pack of 10 |
| 3'-(6-FAM) PS | | |
| 200 nmole columns | 26-2961-52 | Pack of 10 |
| 40 nmole columns | 26-2961-55 | Pack of 10 |
| 3'-Dabcyl PS | | |
| 200 nmole columns | 26-5912-52 | Pack of 10 |
| 40 nmole columns | 26-5912-55 | Pack of 10 |
| 3'-TAMRA PS | | |
| 200 nmole columns | 26-5910-52 | Pack of 10 |
| 40 nmole columns | 26-5910-55 | Pack of 10 |
| 3'-BiotinTEG PS | | |
| 200 nmole columns | 26-2955-52 | Pack of 10 |
| 40 nmole columns | 26-2955-55 | Pack of 10 |

RELATED

Universal Supports28

ABI 3900 1000Å CPG COLUMNS

Glen Research's ABI 3900 1000Å CPG columns bring the lower cost of CPG to this platform while maintaining the high synthesis efficiency of 1000Å CPG. Our columns offer the following key attributes:

- No need to change instrument settings
- No need to change software parameters
- Easier handling post-synthesis compared to PS
- High quality 1000Å CPG for optimal synthesis results

QUALITY ASSURANCE

Every batch of these CE Phosphoramidites is tested as follows:

1. **HPLC**
 - a) Identity is confirmed by comparison with a reference sample.
 - b) Purity is determined by HPLC to be $\geq 98.0\%$.
2. **TLC**

Purity is verified by TLC.
3. **³¹P NMR**

Purity is determined by ³¹P NMR to be $\geq 98\%$.
4. **Coupling Test**

Coupling efficiency is determined to be $\geq 99\%$.
5. **Solution Test**

A 0.1M solution is determined to be clear and free of particulate contamination.
6. **Loss on Drying**

Volatile contaminants are determined to be $\leq 2\%$.

RELATED

Depurination Resistant dA26

EXPEDITE INSTRUMENTS

1. For use on Expedite 8905 instruments.
2. For use on Expedite 8909 instruments.

STERLING CE PHOSPHORAMIDITES

Glen Research CE (β -cyanoethyl) Phosphoramidites are produced and packaged to ensure the highest performance on DNA synthesizers. Every Glen Research product is accompanied by a Certificate of Analysis and HPLC trace, showing the results of our QC testing. Every Glen Research monomer vial is specially cleaned to eliminate particulate contamination.

| Item | Catalog No. | Pack |
|---------------------------|-------------|-------|
| dA-CE Phosphoramidite | 10-1000-C2 | 0.25g |
| | 10-1000-C5 | 0.5g |
| | 10-1000-1C | 1.0g |
| | 10-1000-2C | 2.0g |
| dC-CE Phosphoramidite | 10-1010-C2 | 0.25g |
| | 10-1010-C5 | 0.5g |
| | 10-1010-1C | 1.0g |
| | 10-1010-2C | 2.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-C2 | 0.25g |
| | 10-1015-C5 | 0.5g |
| | 10-1015-1C | 1.0g |
| | 10-1015-2C | 2.0g |
| dG-CE Phosphoramidite | 10-1020-C2 | 0.25g |
| | 10-1020-C5 | 0.5g |
| | 10-1020-1C | 1.0g |
| | 10-1020-2C | 2.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-C2 | 0.25g |
| | 10-1029-C5 | 0.5g |
| | 10-1029-1C | 1.0g |
| | 10-1029-2C | 2.0g |
| dT-CE Phosphoramidite | 10-1030-C2 | 0.25g |
| | 10-1030-C5 | 0.5g |
| | 10-1030-1C | 1.0g |
| | 10-1030-2C | 2.0g |

STERLING SOLVENTS/REAGENTS

All solvents and reagents are prepared to our exacting specifications to ensure the highest synthesis efficiency and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination. Glen Research uses freshly sublimed 1H-tetrazole for premium performance on Expedite synthesizers.

| Item | Catalog No. | Pack |
|---|-------------------------|-------|
| <i>Activator</i> Tetrazole in Acetonitrile | 30-3102-66 ¹ | 60mL |
| | 30-3102-52 ² | 200mL |
| | 30-3100-57 ² | 450mL |
| <i>Diluent</i> Acetonitrile, anhydrous | 40-4050-45 | 60mL |
| | 40-4050-50 | 100mL |

STERLING SOLVENTS/REAGENTS (CONT.)

| Item | Catalog No. | Pack |
|---|-------------------------|-------|
| <i>Anhydrous Wash</i> | | |
| Acetonitrile, anhydrous | 40-4050-53 ¹ | 300mL |
| | 40-4050-57 ² | 450mL |
| <i>Cap Mix A</i> | | |
| Tetrahydrofuran/Acetic Anhydride | 40-4012-52 ² | 200mL |
| | 40-4012-57 | 450mL |
| <i>Cap Mix B</i> | | |
| 10% 1-Methylimidazole in Tetrahydrofuran/Pyridine | 40-4122-52 ² | 200mL |
| | 40-4122-57 | 450mL |
| <i>Oxidizing Solution</i> | | |
| 0.02M Iodine in Tetrahydrofuran/Water/Pyridine | 40-4132-52 ² | 200mL |
| | 40-4132-57 | 450mL |
| <i>Deblocking Mix</i> | | |
| 3% Trichloroacetic Acid/Dichloromethane | 40-4140-71 ² | 1L |

ABBREVIATIONS

Ac₂O = Acetic Anhydride
 CE = Cyanoethyl
 CPG = Controlled Pore Glass
 DCM = Dichloromethane
 dmf = dimethylformamide
 I₂ = Iodine
 lcaa = long chain alkylamino
 MeIm = 1-Methylimidazole
 μm = micromole(s)
 nm = nanomole(s)
 TCA = Trichloroacetic Acid
 THF = Tetrahydrofuran

RELATED

Alternative Solvents..... 34

BULK CPG LOADING

500Å supports 35-50μmoles/g
 1000Å supports 25-40μmoles/g

STERLING SUPPORTS

All Glen Research supports use the standard long chain alkylamino (lcaa) linker but differ in the glass pore size, 500Å, 1000Å or 2000Å. The 500Å support is appropriate for shorter sequences, while the 1000Å supports perform better in the synthesis of longer (>30-mer) DNA sequences. The 2000Å support is best for very long (>150-mer) oligonucleotides. We have instituted an additional QC test for supports to show the length of oligo that can be prepared before a drop-off in coupling due to steric effects begins to occur. The drop-off point is recorded in the Certificate of Analysis. All Glen Research supports are fully end-capped to ensure that the CPG surface is totally inert, thereby avoiding the introduction of impurity sequences containing deletions at the 3'-terminus.

| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|----------------------|-------------|-------------|-------------|---|-------------|-------------|---------|
| dA | dC | dG | dT | dA,dC,dG,dT (1 column of each base) | Ac-dC | dmf-dG | |
| <i>500Å Columns</i> | | | | | | | |
| 20-2200-42 | 20-2210-42 | 20-2220-42 | 20-2230-42 | 20-2240-42 | 20-2213-42 | | 4x0.2μm |
| 20-2200-41 | 20-2210-41 | 20-2220-41 | 20-2230-41 | 20-2240-41 | 20-2213-41 | | 4x1.0μm |
| 20-2200-14 | 20-2210-14 | 20-2220-14 | 20-2230-14 | | 20-2213-14 | | 1x15μm |
| <i>1000Å Columns</i> | | | | | | | |
| 20-2201-45 | 20-2211-45 | 20-2221-45 | 20-2231-45 | 20-2241-45 | 20-2215-45 | 20-2229-45 | 4x40nm |
| 20-2201-42 | 20-2211-42 | 20-2221-42 | 20-2231-42 | 20-2241-42 | 20-2215-42 | 20-2229-42 | 4x0.2μm |
| 20-2201-41 | 20-2211-41 | 20-2221-41 | 20-2231-41 | 20-2241-41 | 20-2215-41 | 20-2229-41 | 4x1.0μm |
| 20-2201-14 | 20-2211-14 | 20-2221-14 | 20-2231-14 | | 20-2215-14 | 20-2229-14 | 1x15μm |

STERLING SUPPORTS (CONT.)

RELATED

| | |
|--------------------------|----|
| Universal Supports | 28 |
| Q-Supports..... | 31 |
| High Load Supports | 33 |

| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|-----------------------|-------------|-------------|-------------|--|-------------|-------------|---------|
| dA | dC | dG | dT | dA,dC,dG,dT (1 column of each base) | Ac-dC | dmf-dG | |
| <i>2000Å Columns</i> | | | | | | | |
| 20-2202-42 | 20-2212-42 | 20-2222-42 | 20-2232-42 | 20-2242-42 | | | 4x0.2µm |
| <i>500Å Bulk CPG</i> | | | | | | | |
| 20-2000-01 | 20-2010-01 | 20-2020-01 | 20-2030-01 | | 20-2013-01 | | 0.1g |
| 20-2000-02 | 20-2010-02 | 20-2020-02 | 20-2030-02 | | 20-2013-02 | | 0.25g |
| 20-2000-10 | 20-2010-10 | 20-2020-10 | 20-2030-10 | | 20-2013-10 | | 1.0g |
| <i>1000Å Bulk CPG</i> | | | | | | | |
| 20-2001-01 | 20-2011-01 | 20-2021-01 | 20-2031-01 | | 20-2015-01 | 20-2029-01 | 0.1g |
| 20-2001-02 | 20-2011-02 | 20-2021-02 | 20-2031-02 | | 20-2015-02 | 20-2029-02 | 0.25g |
| 20-2001-10 | 20-2011-10 | 20-2021-10 | 20-2031-10 | | 20-2015-10 | 20-2029-10 | 1.0g |
| <i>2000Å Bulk CPG</i> | | | | | | | |
| 20-2002-01 | 20-2012-01 | 20-2022-01 | 20-2032-01 | | | | 0.1g |
| 20-2002-02 | 20-2012-02 | 20-2022-02 | 20-2032-02 | | | | 0.25g |
| 20-2002-10 | 20-2012-10 | 20-2022-10 | 20-2032-10 | | | | 1.0g |

| Item | Catalog No. | Pack |
|---|-------------|------------|
| Empty Synthesis Columns, 40nm, 0.2µm Expedite Style | 20-0021-02 | Pack of 10 |
| Empty Synthesis Columns, 1µm Expedite Style | 20-0021-01 | Pack of 10 |
| Replacement Filters-Expedite | 20-0021-0F | Pack of 20 |
| Empty Synthesis Columns - TWIST 10µm/15µm | 20-0040-00 | Pack of 10 |
| Replacement Frits - TWIST 10µm/15µm | 20-0040-0F | Pack of 20 |

TWIST is a trademark of Glen Research.
Expedite is a trademark of Applied Biosystems.

DNA PHOSPHORAMIDITES - SPECIAL PACKAGING

We offer our high quality DNA phosphoramidites specifically packaged for high throughput and large-scale synthesis customers. These customers normally require high quality materials produced under the guidelines of a validated quality management system while still being priced aggressively. These products include the usual Glen Research certification and guarantees and they are available in larger packs or in bulk. The core catalog numbers for regular DNA phosphoramidites are shown below. For these products, please request a quote.

| Item | Catalog No. |
|---------------------------|-------------|
| dA-CE Phosphoramidite | 10-1000-SP |
| dC-CE Phosphoramidite | 10-1010-SP |
| Ac-dC-CE Phosphoramidite | 10-1015-SP |
| dG-CE Phosphoramidite | 10-1020-SP |
| dmf-dG-CE Phosphoramidite | 10-1029-SP |
| dT-CE Phosphoramidite | 10-1030-SP |

INSTRUMENT TYPES

Glen Research packages these monomers in a variety of industry-standard vials and bottles. Please provide the exact specification of the bottle required prior to receiving a quotation.

STERLING CE PHOSPHORAMIDITES

MerMade synthesizers belong to a family of synthesizers, including the column-based MerMade 4, MerMade 6 and 12 instruments and the parallel array synthesizers, MerMade 192 and MerMade 192E, manufactured by BioAutomation Corporation. Their website can be found at: <http://www.BioAutomation.com>. Phosphoramidite monomers are packaged in 30mL and 240mL amber bottles for dissolving at a concentration of 1g/20mL and are connected directly to the instrument. Some instruments may also be configured to accept Applied Biosystems serum vials, as shown on page 6.

QUALITY ASSURANCE

Every batch of these CE Phosphoramidites is tested as follows:

- 1. HPLC**
 - a) Identity is confirmed by comparison with a reference sample.
 - b) Purity is determined by HPLC to be $\geq 98.0\%$.
- 2. TLC**

Purity is verified by TLC.
- 3. ^{31}P NMR**

Purity is determined by ^{31}P NMR to be $\geq 98\%$.
- 4. Coupling Test**

Coupling efficiency is determined to be $\geq 99\%$.
- 5. Solution Test**

A 0.1M solution is determined to be clear and free of particulate contamination.
- 6. Loss on Drying**

Volatile contaminants are determined to be $\leq 2\%$.

RELATED

Depurination Resistant dA 26
Alternative Activators 34

| Item | Catalog No. | Pack |
|---------------------------|-------------|-------|
| dA-CE Phosphoramidite | 10-1000-02M | 0.25g |
| | 10-1000-05M | 0.5g |
| | 10-1000-10M | 1.0g |
| | 10-1000-5S | 5.0g |
| | 10-1000-1S | 10.0g |
| dC-CE Phosphoramidite | 10-1010-02M | 0.25g |
| | 10-1010-05M | 0.5g |
| | 10-1010-10M | 1.0g |
| | 10-1010-5S | 5.0g |
| | 10-1010-1S | 10.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-02M | 0.25g |
| | 10-1015-05M | 0.5g |
| | 10-1015-10M | 1.0g |
| | 10-1015-5S | 5.0g |
| | 10-1015-1S | 10.0g |
| dG-CE Phosphoramidite | 10-1020-02M | 0.25g |
| | 10-1020-05M | 0.5g |
| | 10-1020-10M | 1.0g |
| | 10-1020-5S | 5.0g |
| | 10-1020-1S | 10.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-02M | 0.25g |
| | 10-1029-05M | 0.5g |
| | 10-1029-10M | 1.0g |
| | 10-1029-5S | 5.0g |
| | 10-1029-1S | 10.0g |
| dT-CE Phosphoramidite | 10-1030-02M | 0.25g |
| | 10-1030-05M | 0.5g |
| | 10-1030-10M | 1.0g |
| | 10-1030-5S | 5.0g |
| | 10-1030-1S | 10.0g |

STERLING SOLVENTS/REAGENTS

All solvents and reagents are prepared to our exacting specifications to ensure the highest synthesis efficiency and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination. Parallel synthesizers typically use 5-ethylthio-1H-tetrazole (ETT) as activator to minimize the chance of crystallization. ETT is used at a concentration of 0.25M in acetonitrile, which is far below the level at which crystallization may occur.

| Item | Catalog No. | Pack |
|--|-------------|--------|
| <i>Activator</i> | | |
| 0.25M 5-Ethylthio-1H-Tetrazole in Acetonitrile | 30-3140-57 | 450mL |
| | 30-3140-61 | 960mL |
| | 30-3140-62 | 2000mL |

STERLING SOLVENTS/REAGENTS (CONT.)

| Item | Catalog No. | Pack |
|--|-------------|--------|
| <i>Diluent</i> | | |
| Acetonitrile, anhydrous | 40-4050-50 | 100mL |
| <i>Cap Mix A</i> | | |
| THF/2,6-Lutidine/Acetic Anhydride | 40-4010-57 | 450mL |
| | 40-4010-61 | 960mL |
| | 40-4010-62 | 2000mL |
| <i>Cap Mix B</i> | | |
| 16% 1-Methylimidazole in Tetrahydrofuran | 40-4220-57 | 450mL |
| | 40-4220-61 | 960mL |
| | 40-4220-62 | 2000mL |
| <i>Oxidizing Solution</i> | | |
| 0.02M Iodine in Tetrahydrofuran/Pyridine/Water | 40-4330-57 | 450mL |
| | 40-4330-61 | 960mL |
| | 40-4330-62 | 2000mL |
| <i>Deblocking Mix</i> | | |
| 3% Dichloroacetic acid in Dichloromethane | 40-4040-57 | 450mL |
| | 40-4040-61 | 960mL |
| | 40-4040-62 | 2000mL |
| 3% Trichloroacetic Acid/Dichloromethane | 40-4140-57 | 450mL |
| | 40-4140-61 | 960mL |
| | 40-4140-62 | 2000mL |

ABBREVIATIONS

Ac₂O = Acetic Anhydride
 CE = Cyanoethyl
 CPG = Controlled Pore Glass
 DCM = Dichloromethane
 dmf = dimethylformamide
 I₂ = Iodine
 Melm = 1-Methylimidazole
 TCA = Trichloroacetic Acid
 THF = Tetrahydrofuran

RELATED

Alternative Solvents..... 34
 Universal Supports 28
 Q-Supports..... 31
 High Load Supports..... 33

STERLING SUPPORTS

Columns containing 1000Å CPG are available in packs of 200 to fit MerMade plates. Regular 500Å or 1000Å supports may also be used to fill the wells of regular 96 well plates. However, this requires each plate to be prepared with each nucleoside accurately in all wells. A universal support clearly removes the need for four specific supports and makes preparing plates straightforward. Glen UnySupport™ 40 nmole frits can also be used.

| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-----------|
| dA | dC | dG | dT | Ac-dC | dmf-dG | |
| <i>MerMade 1000Å Columns</i> | | | | | | |
| 20-2001-65 | | 20-2021-65 | 20-2031-65 | 20-2015-65 | 20-2029-65 | 200x50nm |
| 20-2001-62 | | 20-2021-62 | 20-2031-62 | 20-2015-62 | 20-2029-62 | 200x200nm |
| 20-2001-61 | | 20-2021-61 | 20-2031-61 | 20-2015-61 | 20-2029-61 | 48x1.0µm |

| Item | Catalog No. | Pack |
|---------------------------------------|-------------|------------|
| <i>Glen UnySupport™ 1000</i> | | |
| 1 µmole columns | 20-5141-91 | Pack of 96 |
| 200 nmole columns | 20-5141-92 | Pack of 96 |
| 40 nmole columns | 20-5141-95 | Pack of 96 |
| <i>Empty MerMade Columns</i> | | |
| Empty MerMade Columns (50nm) | 20-0050-05 | Pack of 48 |
| Empty MerMade Columns (200nm and 1µm) | 20-0050-02 | Pack of 48 |

STERLING CE PHOSPHORAMIDITES

Glen Research CE (β -cyanoethyl) Phosphoramidites are produced and packaged to ensure the highest performance on DNA synthesizers. Every Glen Research product is accompanied by a Certificate of Analysis and HPLC trace, showing the results of our QC testing. Every Glen Research monomer vial is specially cleaned to eliminate particulate contamination.

QUALITY ASSURANCE

Every batch of these CE Phosphoramidites is tested as follows:

- 1. HPLC**
a) Identity is confirmed by comparison with a reference sample.
b) Purity is determined by HPLC to be $\geq 98.0\%$.
- 2. TLC**
Purity is verified by TLC.
- 3. ^{31}P NMR**
Purity is determined by ^{31}P NMR to be $\geq 98\%$.
- 4. Coupling Test**
Coupling efficiency is determined to be $\geq 99\%$.
- 5. Solution Test**
A 0.1M solution is determined to be clear and free of particulate contamination.
- 6. Loss on Drying**
Volatile contaminants are determined to be $\leq 2\%$.

RELATED

Depurination Resistant dA26

| Item | Catalog No. | Pack |
|---------------------------|-------------|------|
| dA-CE Phosphoramidite | 10-1000-20 | 2.0g |
| | 10-1000-50 | 5.0g |
| dC-CE Phosphoramidite | 10-1010-20 | 2.0g |
| | 10-1010-50 | 5.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-20 | 2.0g |
| | 10-1015-50 | 5.0g |
| dG-CE Phosphoramidite | 10-1020-20 | 2.0g |
| | 10-1020-50 | 5.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-20 | 2.0g |
| | 10-1029-50 | 5.0g |
| dT-CE Phosphoramidite | 10-1030-20 | 2.0g |
| | 10-1030-50 | 5.0g |

STERLING SOLVENTS/REAGENTS

All solvents and reagents are prepared to our exacting specifications to ensure the highest synthesis efficiency and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination.

| Item | Catalog No. | Pack |
|---|-------------|-------|
| <i>Diluent</i> | | |
| Acetonitrile, anhydrous | 40-4050-45 | 60mL |
| | 40-4050-50 | 100mL |
| <i>Activator</i> | | |
| 0.40M Tetrazole in Acetonitrile | 30-3105-71 | 1L |
| <i>Cap Mix A</i> | | |
| Acetonitrile/1-Methylimidazole | 40-4015-71 | 1L |
| 20% 1-Methylimidazole in Acetonitrile/ 2,6-Lutidine | 40-4115-71 | 1L |
| <i>Cap Mix B</i> | | |
| Acetonitrile/Acetic Anhydride/2,6-Lutidine* | 40-4028-71 | 1L |
| 20% Acetic Anhydride in Acetonitrile | 40-4224-71 | 1L |
| 5% Phenoxyacetic Anhydride in Acetonitrile | 40-4128-71 | 1L |
| <i>Oxidizing Solution</i> | | |
| 0.05M Iodine in Pyridine/Water | 40-4035-71 | 1L |
| <i>Deblocking Mix</i> | | |
| 3% Dichloroacetic Acid in Dichloromethane | 40-4040-71 | 1L |
| 3% Trichloroacetic Acid in Dichloromethane | 40-4140-71 | 1L |
| 3% Dichloroacetic Acid in Toluene | 40-4240-71 | 1L |

ABBREVIATIONS

Ac₂O = Acetic Anhydride
 CE = Cyanoethyl
 CPG = Controlled Pore Glass
 DCA = Dichloroacetic Acid
 DCM = Dichloromethane
 I₂ = Iodine
 MeIm = 1-Methylimidazole
 µm = micromole(s)

RELATED

Alternative Solvents 34

*Cap Mix B is a two part formulation that is combined immediately before shipment.

QUALITY ASSURANCE

Every batch of these CE Phosphoramidites is tested as follows:

1. **HPLC**
 - a) Identity is confirmed by comparison with a reference sample.
 - b) Purity is determined by HPLC to be $\geq 98.0\%$.
2. **TLC**

Purity is verified by TLC.
3. **^{31}P NMR**

Purity is determined by ^{31}P NMR to be $\geq 98\%$.
4. **Coupling Test**

Coupling efficiency is determined to be $\geq 99\%$.
5. **Solution Test**

A 0.1M solution is determined to be clear and free of particulate contamination.
6. **Loss on Drying**

Volatile contaminants are determined to be $\leq 2\%$.

RELATED

Depurination Resistant dA 26
Alternative Activators 34

STERLING CE PHOSPHORAMIDITES

Dr. Oligo synthesizers belong to a family of synthesizers, including the parallel array synthesizers, Dr. Oligo 96, Dr. Oligo 192, Dr. Oligo 384 and Dr. Oligo 768, manufactured by Biolytic® Lab Performance, Inc. in Fremont, CA. Their web site can be found at: <http://www.biolytic.com>. Phosphoramidite monomers are packaged in 30mL and 240mL amber bottles for dissolving at a concentration of 1g/20mL and are connected directly to the instrument. Some instruments may also be configured to accept Applied Biosystems serum vials.

| Item | Catalog No. | Pack |
|---------------------------|-------------|-------|
| dA-CE Phosphoramidite | 10-1000-02M | 0.25g |
| | 10-1000-05M | 0.5g |
| | 10-1000-10M | 1.0g |
| | 10-1000-5S | 5.0g |
| | 10-1000-1S | 10.0g |
| dC-CE Phosphoramidite | 10-1010-02M | 0.25g |
| | 10-1010-05M | 0.5g |
| | 10-1010-10M | 1.0g |
| | 10-1010-5S | 5.0g |
| | 10-1010-1S | 10.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-02M | 0.25g |
| | 10-1015-05M | 0.5g |
| | 10-1015-10M | 1.0g |
| | 10-1015-5S | 5.0g |
| | 10-1015-1S | 10.0g |
| dG-CE Phosphoramidite | 10-1020-02M | 0.25g |
| | 10-1020-05M | 0.5g |
| | 10-1020-10M | 1.0g |
| | 10-1020-5S | 5.0g |
| | 10-1020-1S | 10.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-02M | 0.25g |
| | 10-1029-05M | 0.5g |
| | 10-1029-10M | 1.0g |
| | 10-1029-5S | 5.0g |
| | 10-1029-1S | 10.0g |
| dT-CE Phosphoramidite | 10-1030-02M | 0.25g |
| | 10-1030-05M | 0.5g |
| | 10-1030-10M | 1.0g |
| | 10-1030-5S | 5.0g |
| | 10-1030-1S | 10.0g |

STERLING SOLVENTS/REAGENTS

All solvents and reagents are prepared to our exacting specifications to ensure the highest synthesis efficiency and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination. Parallel synthesizers typically use 5-ethylthio-1H-tetrazole (ETT) as activator to minimize the chance of crystallization. ETT is used at a concentration of 0.25M in acetonitrile, which is far below the level at which crystallization may occur.

| Item | Catalog No. | Pack |
|--|-------------|--------|
| <i>Activator</i> | | |
| 0.25M 5-Ethylthio-1H-Tetrazole in Acetonitrile | 30-3140-57 | 450mL |
| | 30-3140-62 | 2000mL |

STERLING SOLVENTS/REAGENTS (CONT.)

| Item | Catalog No. | Pack |
|--|--------------------------|-----------------|
| <i>Diluent</i> Acetonitrile, anhydrous | 40-4050-50 | 100mL |
| <i>Cap Mix A</i> Tetrahydrofuran/2,6-Lutidine/Acetic Anhydride | 40-4010-57 40-4010-62 | 450mL 2000mL |
| <i>Cap Mix B</i> 16% 1-Methylimidazole in Tetrahydrofuran | 40-4220-57 40-4220-62 | 450mL 2000mL |
| <i>Oxidizing Solution</i> 0.02M Iodine in Tetrahydrofuran/Pyridine/H ₂ O | 40-4330-57 40-4330-62 | 450mL 2000mL |
| <i>Deblocking Mix</i> 3% Dichloroacetic acid in Dichloromethane | 40-4040-57 40-4040-62 | 450mL 2000mL |
| 3% Trichloroacetic acid in Dichloromethane | 40-4140-57 40-4140-62 | 450mL 2000mL |

ABBREVIATIONS

Ac₂O = Acetic Anhydride
 CE = Cyanoethyl
 CPG = Controlled Pore Glass
 DCM = Dichloromethane
 dmf = dimethylformamide
 I₂ = Iodine
 Melm = 1-Methylimidazole
 TCA = Trichloroacetic Acid
 THF = Tetrahydrofuran

RELATED

Alternative Solvents 34
 Universal Supports 28
 Q-Supports 31
 High Load Supports 33
 Glen-Pak™ DNA 155

STERLING SUPPORTS

Dr. Oligo instruments are designed for flexibility in the use of supports and columns. They can use fritted plates with loose CPG and ABI 3900 style polystyrene and CPG columns. Glen UnySupport™ 40 nmole frits can also be used.

| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|-------------------------------------|-------------|-------------|-------------|-------------|-------------|-----------|
| dA | dC | dG | dT | Ac-dC | dmf-dG | |
| <i>ABI 3900 Polystyrene Columns</i> | | | | | | |
| 26-2600-65 | 26-2610-65 | | 26-2630-65 | | 26-2629-65 | 200x40nm |
| 26-2600-62 | 26-2610-62 | | 26-2630-62 | | 26-2629-62 | 200x200nm |
| <i>ABI 3900 1000Å CPG Columns</i> | | | | | | |
| 20-2101-65 | | | 20-2131-65 | 20-2115-65 | 20-2129-65 | 200x40nm |
| 20-2101-62 | | | 20-2131-62 | 20-2115-62 | 20-2129-62 | 200x200nm |
| 20-2101-61 | | | 20-2131-61 | 20-2115-61 | 20-2129-61 | 200x1.0µm |

OLIGONUCLEOTIDE PURIFICATION

BioLytic Labs also offers the innovative Dr. Oligo Processor for high throughput purification of oligonucleotides using Glen-Pak™ DNA Purification Cartridges: <https://www.biolytic.com/p-6814-dr-oligo-processor-fully-automated.aspx>.

STERLING CE PHOSPHORAMIDITES

Glen Research CE (β -cyanoethyl) Phosphoramidites are produced and packaged to ensure the highest performance on DNA synthesizers. Every Glen Research product is accompanied by a Certificate of Analysis and HPLC trace, showing the results of our QC testing. Every Glen Research monomer vial is specially cleaned to eliminate particulate contamination.

QUALITY ASSURANCE

Every batch of these CE Phosphoramidites is tested as follows:

- 1. HPLC**
a) Identity is confirmed by comparison with a reference sample.
b) Purity is determined by HPLC to be $\geq 98.0\%$.
- 2. TLC**
Purity is verified by TLC.
- 3. ^{31}P NMR**
Purity is determined by ^{31}P NMR to be $\geq 98\%$.
- 4. Coupling Test**
Coupling efficiency is determined to be $\geq 99\%$.
- 5. Solution Test**
A 0.1M solution is determined to be clear and free of particulate contamination.
- 6. Loss on Drying**
Volatile contaminants are determined to be $\leq 2\%$.

RELATED

Depurination Resistant dA26

EXPEDITE INSTRUMENTS

1. For use on Expedite 8905 instruments.
2. For use on Expedite 8909 instruments.

| Item | Catalog No. | Pack |
|---------------------------|-------------|-------|
| dA-CE Phosphoramidite | 10-1000-C2 | 0.25g |
| | 10-1000-C5 | 0.5g |
| | 10-1000-1C | 1.0g |
| | 10-1000-2C | 2.0g |
| | 10-1000-5S | 5.0g |
| | 10-1000-1S | 10.0g |
| dC-CE Phosphoramidite | 10-1010-C2 | 0.25g |
| | 10-1010-C5 | 0.5g |
| | 10-1010-1C | 1.0g |
| | 10-1010-2C | 2.0g |
| | 10-1010-5S | 5.0g |
| | 10-1010-1S | 10.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-C2 | 0.25g |
| | 10-1015-C5 | 0.5g |
| | 10-1015-1C | 1.0g |
| | 10-1015-2C | 2.0g |
| | 10-1015-5S | 5.0g |
| | 10-1015-1S | 10.0g |
| dG-CE Phosphoramidite | 10-1020-C2 | 0.25g |
| | 10-1020-C5 | 0.5g |
| | 10-1020-1C | 1.0g |
| | 10-1020-2C | 2.0g |
| | 10-1020-5S | 5.0g |
| | 10-1020-1S | 10.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-C2 | 0.25g |
| | 10-1029-C5 | 0.5g |
| | 10-1029-1C | 1.0g |
| | 10-1029-2C | 2.0g |
| | 10-1029-5S | 5.0g |
| | 10-1029-1S | 10.0g |
| dT-CE Phosphoramidite | 10-1030-C2 | 0.25g |
| | 10-1030-C5 | 0.5g |
| | 10-1030-1C | 1.0g |
| | 10-1030-2C | 2.0g |
| | 10-1030-5S | 5.0g |
| | 10-1030-1S | 10.0g |

STERLING SOLVENTS/REAGENTS

All solvents and reagents are prepared to our exacting specifications to ensure the highest synthesis efficiency and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination. Glen Research uses freshly sublimed 1H-tetrazole for premium performance on Expedite synthesizers.

| Item | Catalog No. | Pack |
|---|-------------|--------|
| <i>Activator</i> | | |
| Tetrazole in Acetonitrile | 30-3102-52 | 200mL |
| | 30-3100-57 | 450mL |
| | 30-3100-62 | 2000mL |
| <i>Diluent</i> | | |
| Acetonitrile, anhydrous | 40-4050-50 | 100mL |
| <i>Cap Mix A</i> | | |
| Tetrahydrofuran/Acetic Anhydride | 40-4012-52 | 200mL |
| | 40-4012-57 | 450mL |
| | 40-4012-62 | 2000mL |
| <i>Cap Mix B</i> | | |
| 10% 1-Methylimidazole in Tetrahydrofuran/Pyridine | 40-4122-52 | 200mL |
| | 40-4122-57 | 450mL |
| | 40-4122-62 | 2000mL |
| <i>Oxidizing Solution</i> | | |
| 0.02M Iodine in Tetrahydrofuran/Water/Pyridine | 40-4132-52 | 200mL |
| | 40-4132-57 | 450mL |
| | 40-4132-62 | 2000mL |
| <i>Deblocking Mix</i> | | |
| 3% Trichloroacetic Acid/Dichloromethane | 40-4140-62 | 2000mL |

ABBREVIATIONS

Ac₂O = Acetic Anhydride
 CE = Cyanoethyl
 CPG = Controlled Pore Glass
 DCM = Dichloromethane
 dmf = dimethylformamide
 I₂ = Iodine
 lcaa = long chain alkylamino
 MeIm = 1-Methylimidazole
 μm = micromole(s)
 nm = nanomole(s)
 TCA = Trichloroacetic Acid
 THF = Tetrahydrofuran

RELATED

Alternative Solvents..... 34

BULK CPG LOADING

| | |
|----------------|---------------|
| 500Å supports | 35-50μmoles/g |
| 1000Å supports | 25-40μmoles/g |

STERLING SUPPORTS

RELATED

| | |
|--------------------------|----|
| Universal Supports | 28 |
| Q-Supports..... | 31 |
| High Load Supports | 33 |

All Glen Research supports use the standard long chain alkylamino (lcaa) linker but differ in the glass pore size, 500Å, 1000Å or 2000Å. The 500Å support is appropriate for shorter sequences, while the 1000Å supports perform better in the synthesis of longer (>30-mer) DNA sequences. The 2000Å support is best for very long (>150-mer) oligonucleotides. We have instituted an additional QC test for supports to show the length of oligo that can be prepared before a drop-off in coupling due to steric effects begins to occur. The drop-off point is recorded in the Certificate of Analysis. All Glen Research supports are fully end-capped to ensure that the CPG surface is totally inert, thereby avoiding the introduction of impurity sequences containing deletions at the 3'-terminus.

| Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Catalog No. | Pack |
|-----------------------|-------------|-------------|-------------|---|-------------|-------------|---------|
| dA | dC | dG | dT | dA,dC,dG,dT (1 column of each base) | Ac-dC | dmf-dG | |
| <i>500Å Columns</i> | | | | | | | |
| 20-2200-42 | 20-2210-42 | 20-2220-42 | 20-2230-42 | 20-2240-42 | 20-2213-42 | | 4x0.2µm |
| 20-2200-41 | 20-2210-41 | 20-2220-41 | 20-2230-41 | 20-2240-41 | 20-2213-41 | | 4x1.0µm |
| 20-2200-14 | 20-2210-14 | 20-2220-14 | 20-2230-14 | | 20-2213-14 | | 1x15µm |
| <i>1000Å Columns</i> | | | | | | | |
| 20-2201-45 | 20-2211-45 | 20-2221-45 | 20-2231-45 | 20-2241-45 | 20-2215-45 | 20-2229-45 | 4x40nm |
| 20-2201-42 | 20-2211-42 | 20-2221-42 | 20-2231-42 | 20-2241-42 | 20-2215-42 | 20-2229-42 | 4x0.2µm |
| 20-2201-41 | 20-2211-41 | 20-2221-41 | 20-2231-41 | 20-2241-41 | 20-2215-41 | 20-2229-41 | 4x1.0µm |
| 20-2201-14 | 20-2211-14 | 20-2221-14 | 20-2231-14 | | 20-2215-14 | 20-2229-14 | 1x15µm |
| <i>2000Å Columns</i> | | | | | | | |
| 20-2202-42 | 20-2212-42 | 20-2222-42 | 20-2232-42 | 20-2242-42 | | | 4x0.2µm |
| <i>500Å Bulk CPG</i> | | | | | | | |
| 20-2000-01 | 20-2010-01 | 20-2020-01 | 20-2030-01 | | 20-2013-01 | | 0.1g |
| 20-2000-02 | 20-2010-02 | 20-2020-02 | 20-2030-02 | | 20-2013-02 | | 0.25g |
| 20-2000-10 | 20-2010-10 | 20-2020-10 | 20-2030-10 | | 20-2013-10 | | 1.0g |
| <i>1000Å Bulk CPG</i> | | | | | | | |
| 20-2001-01 | 20-2011-01 | 20-2021-01 | 20-2031-01 | | 20-2015-01 | 20-2029-01 | 0.1g |
| 20-2001-02 | 20-2011-02 | 20-2021-02 | 20-2031-02 | | 20-2015-02 | 20-2029-02 | 0.25g |
| 20-2001-10 | 20-2011-10 | 20-2021-10 | 20-2031-10 | | 20-2015-10 | 20-2029-10 | 1.0g |
| <i>2000Å Bulk CPG</i> | | | | | | | |
| 20-2002-01 | 20-2012-01 | 20-2022-01 | 20-2032-01 | | | | 0.1g |
| 20-2002-02 | 20-2012-02 | 20-2022-02 | 20-2032-02 | | | | 0.25g |
| 20-2002-10 | 20-2012-10 | 20-2022-10 | 20-2032-10 | | | | 1.0g |

DEPURINATION RESISTANT CE PHOSPHoramIDITES

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

Expedite E
MerMade M

Columns

For Instrument type [Add](#)

Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

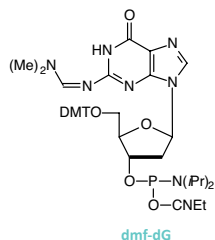
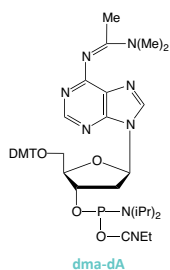
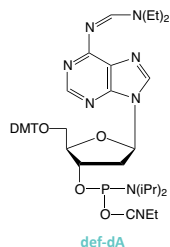
Depurination is defined as the cleavage of the glycosidic bond attaching a purine base to the sugar moiety. Electron withdrawing acyl protecting groups like benzoyl and isobutyryl on the purine amino group(s) destabilize the glycosidic bond, whereas electron donating formamide protecting groups stabilize the glycosidic bond. The consequence of depurination during oligonucleotide synthesis is the loss of the purine base to form an internucleotide linkage containing the abasic sugar at that position. This site is stable during further synthesis cycles but, upon deprotection with basic reagents, the oligonucleotide is cleaved at that position leading to two shorter fragments. The fragment towards the 5' terminus still contains the DMT group. If DMT-ON purification is being used, the depurinated fragments are co-purified along with the full length product as truncated oligonucleotides.

The most commonly used dA-CE Phosphoramidite containing benzoyl protecting groups suffers substantial degradation by depurination after excessive exposure to TCA. At the same time, two depurination resistant dA monomers, protected with diethylformamide (def) and dimethylacetamide (dma), are essentially stable to depurination during the same exposure to TCA.

Both new depurination resistant dA monomers (def and dma protected), were rapidly deprotected in ammonium hydroxide and are fully compatible with regular deprotection strategies. Def-protected-dA was rapidly deprotected with AMA at 65° in 20 minutes, which makes it fully compatible with regular AMA deprotection. In contrast, the dma-protected-dA required 80 minutes with AMA at 65° for complete deprotection.

Dmf-dG is also a depurination resistant CE Phosphoramidite with the isobutyryl group of the original monomer replaced with dimethylformamide (dmf).

Although depurination does occur in regular oligonucleotide synthesis, the degradation is at an extremely low level. However in certain other circumstances, depurination may become more significant, such as synthesis of long oligos, chip-based synthesis, and large-scale synthesis.



| Item | Catalog No. | Pack |
|---------------------------|-------------|-------|
| def-dA-CE Phosphoramidite | 10-1504-02 | 0.25g |
| | 10-1504-05 | 0.5g |
| | 10-1504-10 | 1.0g |
| dmf-dG-CE Phosphoramidite | 10-1029-02 | 0.25g |
| | 10-1029-05 | 0.5g |
| | 10-1029-10 | 1.0g |
| | 10-1029-20 | 2.0g |
| | 10-1029-40 | 4.0g |

ULTRAMILD CE PHOSPHoramidites

An alternative protecting scheme for the normal CE phosphoramidites should allow UltraMILD deprotection and should not react with a wider variety of tags and labels. A set of monomers using phenoxyacetyl (Pac) protected dA and 4-isopropylphenoxyacetyl (iPr-Pac) protected dG, along with acetyl protected dC, met the desired criteria for UltraMILD deprotection.

We recommend the use of phenoxyacetic anhydride (Pac₂O) in Cap A, which removes the possibility of exchange of the iPr-Pac protecting group on the dG with acetate from the acetic anhydride capping mix. Cleavage and deprotection can be carried out in 2 hours at room temperature with ammonium hydroxide or 4 hours with 0.05M potassium carbonate in methanol.

| Item | Catalog No. | Pack |
|-------------------------------|-------------|-------|
| Pac-dA-CE Phosphoramidite | 10-1601-02 | 0.25g |
| | 10-1601-05 | 0.5g |
| | 10-1601-10 | 1.0g |
| Ac-dC-CE Phosphoramidite | 10-1015-02 | 0.25g |
| | 10-1015-05 | 0.5g |
| | 10-1015-10 | 1.0g |
| iPr-Pac-dG-CE Phosphoramidite | 10-1621-02 | 0.25g |
| | 10-1621-05 | 0.5g |
| | 10-1621-10 | 1.0g |

ULTRAMILD SUPPORTS

| Item | Catalog No. | Catalog No. | Catalog No. | Pack |
|----------------------|-------------|-------------|-------------|---------|
| | Pac-dA | Ac-dC | iPr-Pac-dG | |
| UltraMild CPG (Bulk) | 20-2601-01 | Listed | 20-2621-01 | 0.1g |
| | 20-2601-02 | on | 20-2621-02 | 0.25g |
| | 20-2601-10 | Page 8 | 20-2621-10 | 1.0g |
| ABI Columns | 20-2701-45 | 20-2115-45 | 20-2721-45 | 4X40nm |
| | 20-2701-42 | 20-2115-42 | 20-2721-42 | 4X0.2μm |
| | 20-2701-41 | 20-2115-41 | 20-2721-41 | 4X1μm |
| | 20-2701-13 | 20-2115-13 | 20-2721-13 | 10μm |
| | 20-2701-45 | 20-2115-45 | 20-2721-45 | 4X40nm |
| Expedite Columns | 20-2801-45 | 20-2215-45 | 20-2821-45 | 4X40nm |
| | 20-2801-42 | 20-2215-42 | 20-2821-42 | 4X0.2μm |
| | 20-2801-41 | 20-2215-41 | 20-2821-41 | 4X1μm |
| | 20-2801-14 | 20-2215-14 | 20-2821-14 | 15μm |

ULTRAMILD SOLVENTS/REAGENTS

| Item | Catalog No. | Pack |
|---|-------------|-------|
| <i>Cap Mix A</i> THF/Pyridine/Pac ₂ O (Applied Biosystems) | 40-4210-52 | 200mL |
| | 40-4210-57 | 450mL |
| THF/Pac ₂ O (Expedite) | 40-4212-52 | 200mL |
| | 40-4212-57 | 450mL |
| <i>Deprotection Solution</i> 0.05M Potassium Carbonate in Methanol | 60-4600-30 | 30mL |
| | 60-4600-52 | 200mL |
| | 60-4600-57 | 450mL |

RELATED

Universal Support III.....30

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

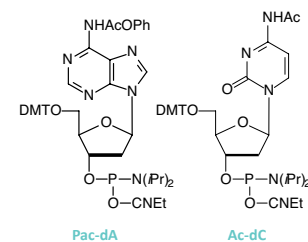
| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

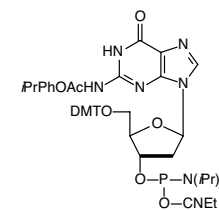
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)



Pac-dA

Ac-dC



iPr-Pac-dG

GLEN UNYSUPPORT

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers
For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns
For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

REFERENCES

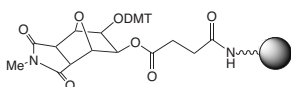
- (1) A.P. Guzaev, and M. Manoharan, *J Am Chem Soc*, 2003, **125**, 2380-2381.
 (2) R.K. Kumar, A.P. Guzaev, C. Rentel, and V.T. Ravikumar, *Tetrahedron*, 2006, **62**, 4528.

ELIMINATION CONDITIONS

| Reagent | Conditions |
|--|---------------------------------|
| Ammonium hydroxide | 80°C/2h 55°C/8h |
| Ammonium hydroxide/ 40% Methylamine (AMA) | 80°C/0.5h 65°C/1h 55°C/8h |
| Methylamine Gas | 65°C/0.5h/30psi |
| Potassium Carbonate in Methanol | RT/17h |
| t-Butylamine/Water (1:3 v/v) | 60°C/4h |

A recent development has been the use of a support based on a molecule which is “conformationally preorganized” to accelerate the dephosphorylation reaction.^{1,2} By using a rigid bicyclic molecule on the support, the rate of elimination is markedly faster than the original Universal Support. The structure of Glen UnySupport™ is shown below. The N-phenyl version, developed at Isis Pharmaceuticals as UnyLinker™, is available from several companies for large scale oligo synthesis. Glen UnySupport is the N-methyl version, which is preferred for high throughput oligonucleotide synthesis since methylamine rather than aniline is formed on deprotection. We are happy to offer Glen UnySupport in a variety of popular formats under license from Ionis Pharmaceuticals.

| Item | Catalog No. | Pack |
|--------------------------------|-------------|-------|
| Bulk Supports | | |
| Glen UnySupport (500Å CPG) | 20-5040-01 | 0.1g |
| | 20-5040-02 | 0.25g |
| | 20-5040-10 | 1.0g |
| Glen UnySupport (1000Å CPG) | 20-5041-01 | 0.1g |
| | 20-5041-02 | 0.25g |
| | 20-5041-10 | 1.0g |
| Glen UnySupport (1400Å CPG) | 20-5044-01 | 0.1g |
| | 20-5044-02 | 0.25g |
| | 20-5044-10 | 1.0g |
| Glen UnySupport (2000Å CPG) | 20-5042-01 | 0.1g |
| | 20-5042-02 | 0.25g |
| | 20-5042-10 | 1.0g |
| High Load Glen UnySupport | 25-5040-01 | 0.1g |
| | 25-5040-02 | 0.25g |
| | 25-5040-10 | 1.0g |
| Glen UnySupport PS | 26-5040-01 | 0.1g |
| | 26-5040-02 | 0.25g |
| | 26-5040-10 | 1.0g |



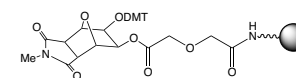
Glen UnySupport

| Item | Catalog No. | Pack |
|---------------------------------------|-------------|------------|
| Columns | | |
| 1000Å | | |
| <i>ABI Format (not LV)</i> | | |
| 1 μmole columns | 20-5141-41 | Pack of 4 |
| 0.2 μmole columns | 20-5141-42 | Pack of 4 |
| 40 nmole columns | 20-5141-45 | Pack of 4 |
| 10 μmole column (TWIST Format) | 20-5141-13 | Pack of 1 |
| <i>ABI 3900 Format</i> | | |
| Glen UnySupport PS | | |
| 200 nmole columns | 26-5140-52 | Pack of 10 |
| 40 nmole columns | 26-5140-55 | Pack of 10 |
| <i>Expedite Format</i> | | |
| 1 μmole columns | 20-5241-41 | Pack of 4 |
| 0.2 μmole columns | 20-5241-42 | Pack of 4 |
| 40 nmole columns | 20-5241-45 | Pack of 4 |
| 15 μmole column (TWIST Format) | 20-5241-14 | Pack of 1 |
| <i>96 Well Format (MerMade, etc.)</i> | | |
| 1 μmole columns | 20-5141-91 | Pack of 96 |
| 200 nmole columns | 20-5141-92 | Pack of 96 |
| 40 nmole columns | 20-5141-95 | Pack of 96 |
| 1400Å | | |
| <i>ABI Format</i> | | |
| 1 μmole columns | 20-5144-41 | Pack of 4 |
| 0.2 μmole columns | 20-5144-42 | Pack of 4 |
| 10 μmole column (TWIST Format) | 20-5144-13 | Pack of 1 |
| <i>Expedite Format</i> | | |
| 1 μmole columns | 20-5244-41 | Pack of 4 |
| 0.2 μmole columns | 20-5244-42 | Pack of 4 |
| 2000Å | | |
| <i>ABI Format</i> | | |
| 0.2 μmole columns | 20-5142-42 | Pack of 4 |
| <i>Expedite Format</i> | | |
| 0.2 μmole columns | 20-5242-42 | Pack of 4 |

Please inquire about 500Å columns.

ELIMINATION CONDITIONS

| Reagent | Conditions |
|--|---------------------------------|
| Ammonium hydroxide | 80°C/2h 55°C/8h |
| Ammonium hydroxide/ 40% Methylamine (AMA) | 80°C/0.5h 65°C/1h 55°C/8h |
| Methylamine Gas | 65°C/0.5h/30psi |
| Potassium Carbonate in Methanol | RT/17h |
| t-Butylamine/Water (1:3 v/v) | 60°C/4h |



Glen UnySupport FC

UNIVERSAL SUPPORT III

REFERENCES

- (1) A.V. Azhayev, *Tetrahedron*, 1999, **55**, 787-800.
 (2) A.V. Azhayev and M. Antopolsky, *Tetrahedron*, 2001, **57**, 4977-4986.

CLEAVAGE AND DEPROTECTION

1. Cleavage

For standard and UltraFast deprotection protocols, cleave the oligo from the support using 2M ammonia in methanol at room temperature for 30 minutes. (Only for oligonucleotides greater than 50 nucleotides in length, rinse the support with a further volume of water. Combine the two washes and evaporate to dryness.)

2. Deprotection

Standard

Add 1 volume of 30% ammonium hydroxide, seal and deprotect using the conditions appropriate for removal of the protecting groups on the nucleobases.

UltraFast

Add 1 volume of AMA (ammonium hydroxide/40% aqueous methylamine 1:1) seal and deprotect at 65°C for 10 minutes.

UltraMild Using Ammonium Hydroxide

Add 1 volume of ammonium hydroxide, seal and leave at room temperature for 8 hours.

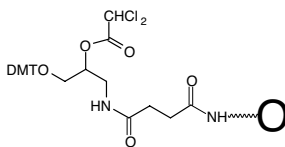
UltraMild Cleavage and Deprotection

Using Potassium Carbonate in Methanol
 Cleave the oligo from the support using 50 mM potassium carbonate in methanol at room temperature for 30 minutes. Seal and leave overnight at room temperature.

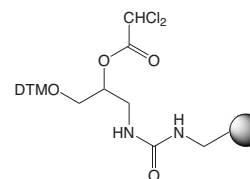
The key step in the use of any universal support in oligonucleotide synthesis is the dephosphorylation of the 3'-phosphate group to form the desired 3'-hydroxyl group. Azhayev^{1,2} has excelled in the investigation of neighboring group assistance in the dephosphorylation reaction. Amide groups may be considered to be weak N-H acids and can display basic properties in ammonium hydroxide or aqueous methylamine. In the original work^{1,2}, (±)-3-amino-1,2-propanediol was used to form a novel universal support (1). A succinate linker attaches the 3-amino group to the support and the 2-OH is protected with a base-labile group to set up an amide assisted elimination in mildly basic conditions. In this way, the dephosphorylation reaction would eliminate the desired 3'-OH oligonucleotide into solution and the product of any β-elimination competing side reaction would remain bound to the support. A further improvement has been achieved by using a carbamate group to connect the universal linker to the support, as in our product Universal Support III (2). Using Universal Support III, an oligo yield of >80% can be achieved on polymeric supports, with purity equivalent to the same oligo prepared normally.

Conditions for Cleavage and Deprotection are outlined in the table opposite. Universal Support III has been shown to generate oligonucleotides with the same efficacy in polymerase extension reactions as regular oligos. Despite the mild elimination reaction, oligonucleotides up to 75mer in length can be prepared routinely without loss of oligo during the synthesis cycles. This support is also used for the production of siRNA oligos.

| Item | Catalog No. | Pack |
|---------------------------------------|-------------|------------|
| Bulk Support | | |
| Universal Support III PS | 26-5010-01 | 0.1g |
| | 26-5010-02 | 0.25g |
| | 26-5010-10 | 1.0g |
| ABI Format (not LV) | | |
| Universal Support III PS | | |
| 1 μmole columns | 26-5110-41 | Pack of 4 |
| 0.2 μmole columns | 26-5110-42 | Pack of 4 |
| 40 nmole columns | 26-5110-45 | Pack of 4 |
| 10 μmole column (TWIST Format) | 26-5110-13 | Pack of 1 |
| Expedite Format | | |
| 1 μmole columns | 26-5210-41 | Pack of 4 |
| 0.2 μmole columns | 26-5210-42 | Pack of 4 |
| 40 nmole columns | 26-5210-45 | Pack of 4 |
| 15 μmole column (TWIST Format) | 26-5210-14 | Pack of 1 |
| 96 Well Format (MerMade, etc.) | | |
| Universal Support III PS | | |
| 1 μmole columns | 26-5110-91 | Pack of 96 |
| 200 nmole columns | 26-5110-92 | Pack of 96 |
| 40 nmole columns | 26-5110-95 | Pack of 96 |
| ABI 3900 Format | | |
| Universal Support III PS | | |
| 200 nmole columns | 26-5110-52 | Pack of 10 |
| 40 nmole columns | 26-5110-55 | Pack of 10 |



Universal Support (1)



Universal Support III (2)

Q-SUPPORTS

Oligonucleotides are routinely prepared on supports to which the first nucleoside is attached via a succinate linkage. Over the years, the succinate linkage has demonstrated stability during the synthesis process but has sufficient lability to be cleaved quickly in the deprotection step. However, if the cleavage step is carried out with ammonium hydroxide manually or on the synthesizer, it consumes one hour of precious time while releasing only about 80% of the oligonucleotide. This step is, therefore, a bottleneck in the productivity of many synthesis groups.

Is it possible to find a replacement to the succinate group which offers good stability to the synthesis reagents while offering a much faster cleavage step? The oxalate group has been shown to be very labile during cleavage but its stability to the normal synthesis reagents is not good, requiring changes for successful use. In a practical but elegant study¹ of various bifunctional carboxylic acids, Richard Pon's group identified hydroquinone-O,O'-diacetic acid as the most satisfactory alternative to the succinate group. Nucleosides with this linker arm (Q-linker) are attached to supports with the same ease as the succinyl linker arm.

The cleavage time in ammonium hydroxide at room temperature was found to be 2 minutes, but what about the stability during synthesis? How significant was premature cleavage of oligonucleotide on the synthesizer because of the basic reagents in the capping mixes and oxidizer? Pon showed that the Q-linker is stable to the capping reagents but very slightly labile to the oxidizer (8% cleavage in overnight exposure which would correspond to about 2,000 normal synthesis cycles).

We tested the significance of premature cleavage by preparing sixteen 20mer oligonucleotides on a 0.2 μ mole scale, eight with succinate and eight with Q-linkers. The succinate supported oligos were cleaved for 1 hour at room temperature, while those on the Q-support were cleaved for 2 minutes. Both sets were then deprotected normally with ammonium hydroxide. The Q-supports actually gave 5% better yields of product than the succinate supports. Oligo purities were equivalent in both sets.

The Q-linker is absolutely compatible with all hydrolytic cleavage procedures, but especially mild procedures like potassium carbonate in methanol. Pon also showed that it is preferable for RNA supports, improving the cleavage time for 2'-silyl protected nucleoside supports from 2 hours (60-65% cleavage) to 5 minutes (95% cleavage).

We are offering Q-linkers of the four regular nucleosides on 500Å CPG in 0.2 and 1 μ mole scales.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

REFERENCE

(1) R.T. Pon and S.Y. Yu, *Tetrahedron Lett.*, 1997, **38**, 3327-3330.

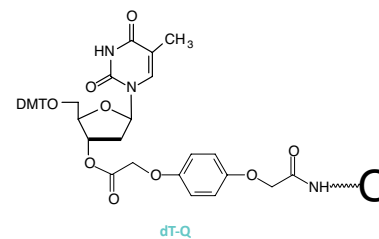
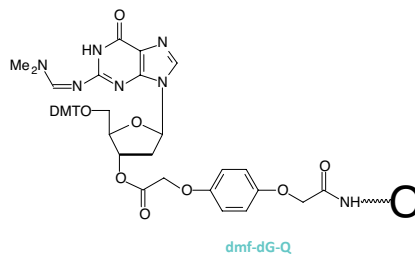
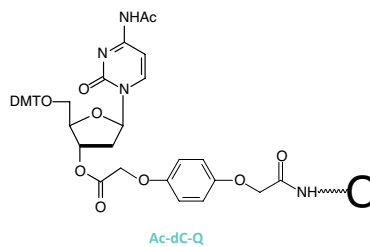
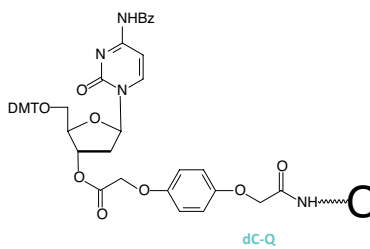
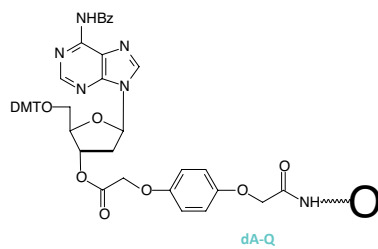
Q/SUCCINATE COMPARISON

| Q-Support (2 minutes cleavage) | Succinate (60 minutes cleavage) |
|--------------------------------------|---------------------------------------|
| 132 ODU* | 125 ODU* |

*Average crude yield from eight 1 μ mole columns deprotected normally.

Q-SUPPORTS (CONT.)

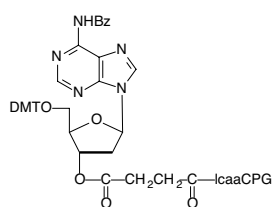
| Catalog No. dA | Catalog No. dC | Catalog No. Ac-dC | Catalog No. dmf-dG | Catalog No. dT | Pack |
|----------------------------|-------------------|----------------------|-----------------------|-------------------|---------|
| <i>500Å Bulk Support</i> | | | | | |
| 21-2000-01 | 21-2010-01 | 21-2013-01 | 21-2029-01 | 21-2030-01 | 0.1g |
| 21-2000-02 | 21-2010-02 | 21-2013-02 | 21-2029-02 | 21-2030-02 | 0.25g |
| 21-2000-10 | 21-2010-10 | 21-2013-10 | 21-2029-10 | 21-2030-10 | 1.0g |
| <i>ABI Format (not LV)</i> | | | | | |
| 21-2100-41 | 21-2110-41 | 21-2113-41 | 21-2129-41 | 21-2130-41 | 4X1µm |
| 21-2100-42 | 21-2110-42 | 21-2113-42 | 21-2129-42 | 21-2130-42 | 4X0.2µm |
| <i>Expedite Format</i> | | | | | |
| 21-2200-41 | 21-2210-41 | 21-2213-41 | 21-2229-41 | 21-2230-41 | 4X1µm |
| 21-2200-42 | 21-2210-42 | 21-2213-42 | 21-2229-42 | 21-2230-42 | 4X0.2µm |



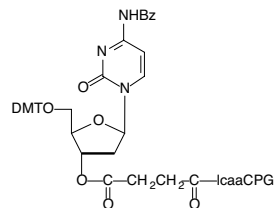
HIGH LOAD CPG

Our high loading support is based on controlled pore silica and it retains the usual 500Å pores. The spacer is also conventional. The only significant difference is the loading which is in the range 80 - 130µmoles/g or about 2.5 times the loading of normal 500Å CPG. Typical loadings for our high load CPG are in the 100 - 120µmoles/g range. As a consequence of the high loading, this support should not be used for sequences longer than 40mers. This high loading support is available in columns for most synthesizers. The 2.5µmole column is identical to our standard 1µmole column (with the exception of the loading). It should be used on occasions when greater than 1µmole is desired but when a 10 or 15µmole synthesis is too high. It should be run using the 1µmole cycle. The 25µmole column is identical to the 10µmole column used on Applied Biosystems synthesizers. It is run using the 10µmole cycle. The 35µmole column is used as an alternative to the 15µmole Expedite column. Again no changes to the standard cycle are recommended. The support is of course available in bulk for use on large-scale synthesizers. A word of caution is in order. When using a column with a higher load than recommended by the instrument manufacturer, there is a much smaller margin for error. All reagents must be fresh and anhydrous diluent and activator must be used. Should you decide to prepare higher-loading columns, ensure that the molar excess of monomer to support nucleoside is at least 5X and preferably 10X.

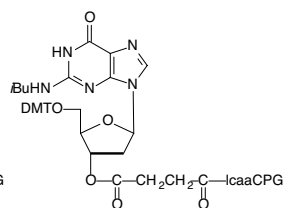
| Item | Catalog No. dA | Catalog No. dC | Catalog No. dG | Catalog No. dT | Pack |
|------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------|
| <i>Columns</i> | | | | | |
| (ABI) 4X2.5µm | 25-2100-17 | 25-2110-17 | 25-2120-17 | 25-2120-4625-2130-46 | 1X25µm |
| (Expedite) | 25-2200-46 25-2200-18 | 25-2210-46 25-2210-18 | 25-2220-46 25-2220-18 | 25-2230-46 25-2230-18 | 4X2.5µm 1X35µm |
| <i>Bulk</i> | | | | | |
| | 25-2000-02 25-2000-10 | 25-2010-02 25-2010-10 | 25-2020-02 25-2020-10 | 25-2030-02 25-2030-10 | 0.25g 1.0g |



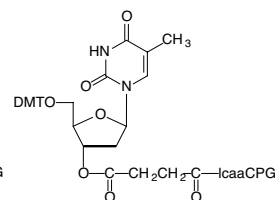
dA-CPG



dC-CPG



dG-CPG



dT-CPG

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers
For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns
For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

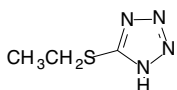
RELATED

Glen UnySupport.....28

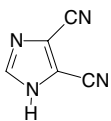
ALTERNATIVE SOLVENTS/REAGENTS

ABBREVIATIONS

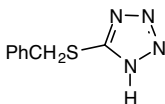
Ac₂O = Acetic Anhydride
 DCA = Dichloroacetic Acid
 DCM = Dichloromethane
 DMAP = Dimethylaminopyridine
 I₂ = Iodine
 Melm = 1-Methylimidazole
 TCA = Trichloroacetic Acid
 THF = Tetrahydrofuran



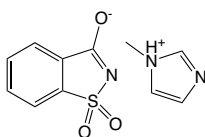
5-Ethylthio-1H-tetrazole



DCI



5-Benzylthio-1H-tetrazole



Saccharin 1-Methylimidazole

INTELLECTUAL PROPERTY

SMI is sold under license from Avecia Biotechnology Inc.

Glen Research offers alternative solvents and reagents in suitable bottles and formulations for use on various DNA synthesizers. All solvents and reagents are prepared to our exacting specifications to ensure the highest coupling efficiencies and are passed through a 0.2 micron filter during packaging to eliminate particulate contamination. Glen Research offers the activators below in powder form for later dissolution in anhydrous acetonitrile or as a prepared solution.

| Item | Catalog No. | Pack |
|--|-------------|--------------|
| <i>Activator</i> | | |
| 5-Ethylthio-1H-tetrazole (ETT) | 30-3040-10 | 1g |
| <i>(Dissolve 1g in 31mL anhydrous acetonitrile for a 0.25M solution)</i> | 30-3040-20 | 2g |
| | 30-3040-25 | 25g |
| 0.25M 5-Ethylthio-1H-tetrazole in Acetonitrile | 30-3140-45 | 45mL |
| <i>(Applied Biosystems)</i> | 30-3140-52 | 200mL |
| | 30-3140-57 | 450mL |
| | 30-3140-62 | 2L |
| <i>(Expedite)</i> | 30-3142-52 | 200mL |
| | 30-3140-57 | 450mL |
| 4,5-Dicyanoimidazole (DCI), crystalline | 30-3050-10 | 1g |
| <i>(Dissolve 1g in 34mL anhydrous acetonitrile for a 0.25M solution)</i> | 30-3050-25 | 25g |
| 4,5-Dicyanoimidazole (DCI) | 30-3060-50 | 5g |
| <i>(Dissolve 1g in 34mL anhydrous acetonitrile for a 0.25M solution)</i> | 30-3060-30 | 30g |
| | 30-3060-K5 | 500g |
| | 30-3060-1K | 1000g |
| 0.25M 4,5-Dicyanoimidazole (DCI) in Acetonitrile | 30-3150-45 | 45mL |
| <i>(Applied Biosystems)</i> | 30-3150-52 | 200mL |
| | 30-3150-57 | 450mL |
| | 30-3150-62 | 2L |
| <i>(Expedite)</i> | 30-3152-52 | 200mL |
| | 30-3150-57 | 450mL |
| 5-Benzylthio-1H-tetrazole (BTT) | 30-3070-10 | 1g |
| <i>(Dissolve 1g in 21.3mL anhydrous acetonitrile for a 0.25M solution)</i> | 30-3070-20 | 2g |
| | 30-3070-25 | 25g |
| 0.25M 5-Benzylthio-1H-tetrazole in Acetonitrile | 30-3170-45 | 45mL |
| <i>(Applied Biosystems)</i> | 30-3170-52 | 200mL |
| | 30-3170-57 | 450mL |
| | 30-3170-62 | 2L |
| <i>(Expedite)</i> | 30-3172-52 | 200mL |
| | 30-3170-57 | 450mL |
| Saccharin 1-Methylimidazole (SMI) | 30-3080 | Discontinued |
| | 30-3180 | Discontinued |
| | 30-3182 | Discontinued |

ALTERNATIVE SOLVENTS/REAGENTS (CONT.)

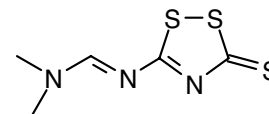
| Item | Catalog No. | Pack |
|--|-------------|-------|
| <i>Cap Mix A</i> | | |
| Tetrahydrofuran/2,6-Lutidine/Acetic Anhydride | 40-4010-52 | 200mL |
| | 40-4010-57 | 450mL |
| | 40-4010-62 | 2L |
| Tetrahydrofuran/Acetic Anhydride (9:1) | 40-4012-62 | 2L |
| <i>Cap Mix B</i> | | |
| 6.5% Dimethylaminopyridine in Tetrahydrofuran <i>(Cap B solutions containing DMAP are preferred by some researchers for preparing long oligos.)</i> | 40-4020-52 | 200mL |
| 10% 1-Methylimidazole in Tetrahydrofuran | 40-4120-52 | 200mL |
| | 40-4120-57 | 450mL |
| | 40-4120-62 | 2L |
| 10% 1-Methylimidazole in Tetrahydrofuran/Pyridine (8:1) | 40-4122-62 | 2L |
| <i>Oxidizing Solution</i> | | |
| 0.02M Iodine in Tetrahydrofuran/Pyridine/Water (70:20:10) | 40-4132-62 | 2L |
| 0.02M Iodine in Tetrahydrofuran/Pyridine/Water (88:20:2) (Low-Water Oxidizer) | 40-4032-52 | 200mL |
| | 40-4032-52E | 200mL |
| | 40-4032-57 | 450mL |
| | 40-4032-62 | 2L |
| <i>Deblocking Mix</i> | | |
| 3% Dichloroacetic acid in Dichloromethane <i>[Dichloroacetic acid (DCA) solutions are more mildly acidic than the Trichloroacetic (TCA) equivalents, possibly causing less depurination of dA sites.]</i> | 40-4040-57 | 450mL |
| | 40-4040-62 | 2L |
| 2.5% Dichloroacetic acid in Dichloromethane | 40-4042-57 | 450mL |
| | 40-4042-62 | 2L |

SULFURIZING REAGENTS

Glen Research's Sulfurizing Reagents are used to prepare phosphorothioate linkages using CE phosphoramidite chemistry. Each reagent exhibits the following attributes:

- 1) Reliably soluble, making them safe to use on automated synthesizers.
- 2) Reaction is fast (30 seconds), making the process convenient on small scales and readily amenable to scale-up.
- 3) Process is efficient, with better than 96% of the linkages being phosphorothioate and the remainder being phosphodiester.

Sulfurizing Reagent II (3-((Dimethylamino-methylidene)amino)-3H-1,2,4-dithiazole-3-thione, DDTT) exhibits all the properties of Beaucage Reagent while adding stability in solution on the synthesizer AND offering strong ability to sulfurize RNA linkages. Sulfurizing Reagent II is available in powder form and as a stable solution.



Sulfurizing Reagent II

| Item | Catalog No. | Pack |
|---|-------------|-------|
| Sulfurizing Reagent II (DDTT) | 40-4037-10 | 1g |
| (Dissolve at a concentration of 1g/100mL to form an approximate 0.05M solution) | 40-4037-20 | 2g |
| 0.05M Sulfurizing Reagent II (DDTT) in Pyridine/Acetonitrile | 40-4137-51 | 100mL |
| | 40-4137-52 | 200mL |
| | 40-4137-57 | 450mL |

5'-CE PHOSPHORAMIDITES

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

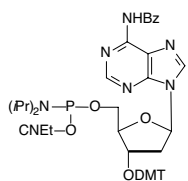
For Instrument type *Add*

Expedite E
Applied Biosystems 3900 A
MerMade M

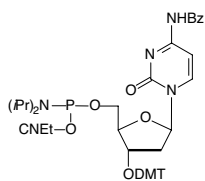
(Please inquire for availability of vials and columns for other instrument types.)

Glen Research 5'-CE (β-cyanoethyl) Phosphoramidites are designed for the production of 5'-5' or 3'-3' linkages, useful in antisense studies, or to synthesize oligonucleotide segments in the opposite sense from normal synthesis (Reverse Synthesis), for structural studies. These monomers are packaged in ABI-style vials (see note box).

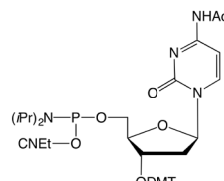
| Item | Catalog No. | Pack |
|------------------------------|-------------|-------|
| dA-5'-CE Phosphoramidite | 10-0001-02 | 0.25g |
| | 10-0001-05 | 0.5g |
| | 10-0001-10 | 1.0g |
| dC-5'-CE Phosphoramidite | 10-0101-02 | 0.25g |
| | 10-0101-05 | 0.5g |
| | 10-0101-10 | 1.0g |
| Ac-dC-5'-CE Phosphoramidite | 10-5101-02 | 0.25g |
| | 10-5101-05 | 0.5g |
| | 10-5101-10 | 1.0g |
| dmf-dG-5'-CE Phosphoramidite | 10-9201-02 | 0.25g |
| | 10-9201-05 | 0.5g |
| | 10-9201-10 | 1.0g |
| dT-5'-CE Phosphoramidite | 10-0301-02 | 0.25g |
| | 10-0301-05 | 0.5g |
| | 10-0301-10 | 1.0g |



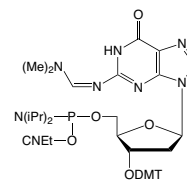
dA-5'-CE Phosphoramidite



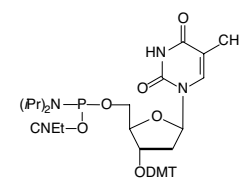
dC-5'-CE Phosphoramidite



Ac-dC-5'-CE Phosphoramidite



Dmf-dG-5'-CE Phosphoramidite

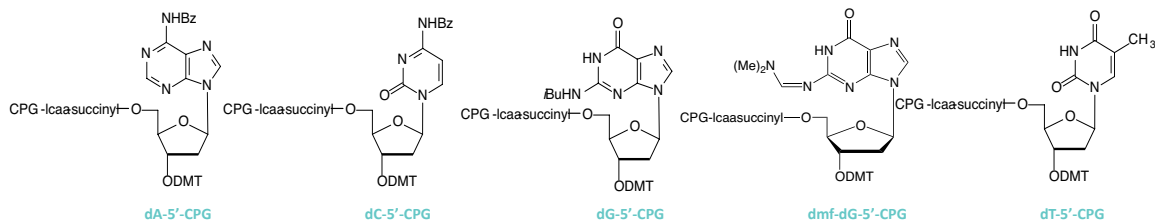


dT-5'-CE Phosphoramidite

5'-SUPPORTS

The following supports are used to produce oligonucleotides with nuclease resistant 3'-3' linkages at the 3' terminus (by attaching regular 3'-CE phosphoramidites) or to produce oligonucleotide sections in the opposite sense (by attaching 5'-CE phosphoramidites). ABI-style columns are supplied unless otherwise requested (see note box).

| Item | Catalog No. | Pack |
|---------------------------------|-------------|-----------|
| dA-5'-CPG | 20-0002-01 | 0.1g |
| | 20-0002-10 | 1.0g |
| 1 μ mole columns | 20-0012-41 | Pack of 4 |
| 0.2 μ mole columns | 20-0012-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-0012-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-0012-14 | Pack of 1 |
| dC-5'-CPG | 20-0102-01 | 0.1g |
| | 20-0102-10 | 1.0g |
| 1 μ mole columns | 20-0112-41 | Pack of 4 |
| 0.2 μ mole columns | 20-0112-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-0112-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-0112-14 | Pack of 1 |
| dG-5'-CPG | 20-0202-01 | 0.1g |
| | 20-0202-10 | 1.0g |
| 1 μ mole columns | 20-0212-41 | Pack of 4 |
| 0.2 μ mole columns | 20-0212-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-0212-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-0212-14 | Pack of 1 |
| dmf-dG-5'-CPG | 20-9202-01 | 0.1g |
| | 20-9202-10 | 1.0g |
| 1 μ mole columns | 20-9212-41 | Pack of 4 |
| 0.2 μ mole columns | 20-9212-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-9212-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-9212-14 | Pack of 1 |
| dT-5'-CPG | 20-0302-01 | 0.1g |
| | 20-0302-10 | 1.0g |
| 1 μ mole columns | 20-0312-41 | Pack of 4 |
| 0.2 μ mole columns | 20-0312-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-0312-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-0312-14 | Pack of 1 |



METHYL PHOSPHONAMIDITES

REFERENCE

(1) M.P. Reddy, F. Farooqui, and N.B. Hanna, Tetrahedron Lett., 1996, 37, 8691-8694.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

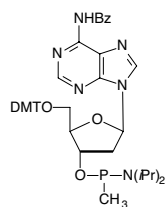
For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

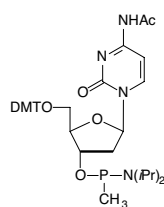
(Please inquire for availability of vials and columns for other instrument types.)

Methyl Phosphonamidites may be used in DNA synthesizers following conventional CE Phosphoramidite protocols to produce oligonucleotides containing one or more methyl phosphonate linkages. However, deprotection and purification techniques differ and a description of the procedures is included in the Technical Bulletin. We also offer the dC monomer with acetyl base protection.¹ This protecting group is removed with ammonium hydroxide during the cleavage step, eliminating modification at the dC sites during the deprotection step using ethylenediamine in ethanol.

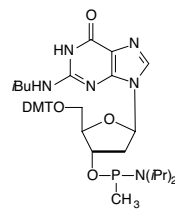
| Item | Catalog No. | Pack |
|--------------------------|-------------|-------|
| dA-Me Phosphonamidite | 10-1100-02 | 0.25g |
| | 10-1100-05 | 0.5g |
| Ac-dC-Me Phosphonamidite | 10-1115-02 | 0.25g |
| | 10-1115-05 | 0.5g |
| dG-Me Phosphonamidite | 10-1120-02 | 0.25g |
| | 10-1120-05 | 0.5g |
| dT-Me Phosphonamidite | 10-1130-02 | 0.25g |
| | 10-1130-05 | 0.5g |



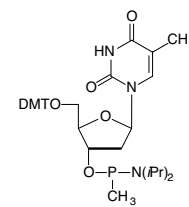
dA-Me Phosphonamidite



Ac-dC-Me Phosphonamidite



dG-Me Phosphonamidite



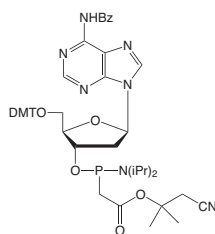
dT-Me Phosphonamidite

PACE PHOSPHoramidites

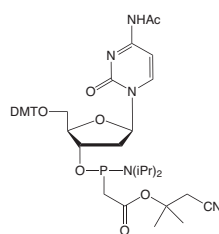
Phosphonoacetate (PACE) modified oligonucleotides show great potential as biological modifiers in a wide variety of research applications. PACE monomers are part of a family of Phosphonocarboxylate monomers. The monomers can be easily incorporated into complex oligonucleotides and are compatible with a wide variety of other sugar or heterobase modifications. PACE DNA can be conjugated through the carboxylic acid functional group. They have been shown to be active in siRNA duplexes and accelerate the initial rate of cleavage by RNase H-1 when incorporated with phosphorothioates. However, the most interesting observation to date is that they exhibit an unprecedented enhancement in penetration of cultured cells.

PACE monomers are fully soluble in acetonitrile at a recommended concentration of 0.1M and are compatible with standard DNA synthesizers. As an optimal cycle, we recommend using DCI as an activator (30-3150-XX) and a 15 minute coupling time. Following coupling, cap using Unicap (10-4410-XX) with a regular coupling time and then oxidize using 0.5M CSO for 3 minutes. Alternatively, a 33 minute coupling time using 0.45M tetrazole, oxidation using low-water iodine (40-4032-XX) followed by capping with 6.5% DMAP as Cap B will give acceptable results. For deprotection, pre-treat the synthesis column with 1.5% DBU in anhydrous acetonitrile for 60 minutes at room temperature to remove 1,1-dimethyl-2-cyanoethyl protecting groups. Rinse the column with acetonitrile, dry under argon and complete the deprotection with 40% aqueous methylamine for 2 hours at room temperature.

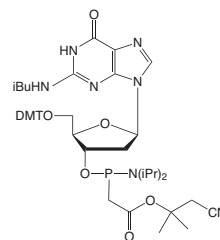
| Item | Catalog No. | Pack |
|----------------------------|-------------|--------------|
| dA-PACE Phosphoramidite | 10-1140 | Discontinued |
| Ac-dC-PACE Phosphoramidite | 10-1150 | Discontinued |
| dG-PACE Phosphoramidite | 10-1160 | Discontinued |
| dT-PACE Phosphoramidite | 10-1170 | Discontinued |



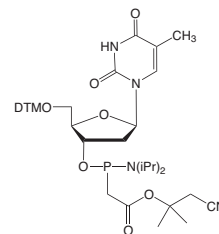
dA-PACE Phosphoramidite



Ac-dC-PACE Phosphoramidite



dG-PACE Phosphoramidite



dT-PACE Phosphoramidite

INTELLECTUAL PROPERTY

These products are covered by patent, US 7,067,641, and patents pending owned by Metasense Technologies. Purchase of all or any of these products includes a limited license to use the products solely for the manufacture of oligonucleotides for research use only. This license specifically excludes the use of the product or oligonucleotides containing the product for: (a) therapeutic or diagnostic applications (including kits, pools, libraries and other products or services that incorporate oligonucleotides containing the product), (b) any in vivo toxicity/safety study in support of an investigational new drug application (or foreign counterpart), or (c) resale (including sale of kits, pools, libraries and other products or services that incorporate the product or oligonucleotides containing the product). If such activities have commercial application, a separate license is required from Metasense Technologies. Neither the product nor any product created through its use may be used in human clinical trials.

A simple agreement must be signed before end-users and custom oligo services may purchase these products for use as defined above.

<https://www.glenresearch.com>

RELATED

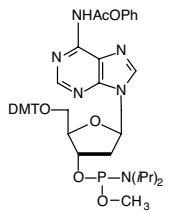
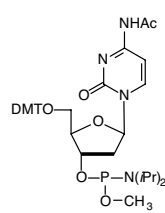
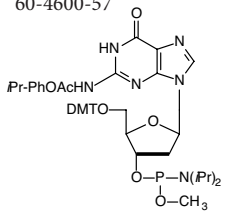
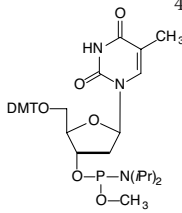
| | |
|-------------------|-----|
| DCI | 34 |
| UniCap | 36 |
| 0.5M CSO | 36 |
| 2'-OMe-PACE | 153 |

METHYL PHOSPHORAMIDITES

For many years, Glen Research has supplied methyl phosphoramidites in addition to β -cyanoethyl (CE) phosphoramidites for the few situations where the more labile cyanoethyl group is not an advantage. Some of our customers, probably remembering that the methyl group was removed specifically with thiophenol, have tried to use these monomers to prepare the interesting, uncharged, and nuclease-resistant methyl phosphotriester linkage. Unfortunately, this linkage is labile to ammonium hydroxide and the regular phosphodiester linkage is formed (along with a small amount of chain scission). We offer UltraMild methyl phosphoramidites for this application. Oligos produced from these monomers can be deprotected with potassium carbonate in methanol to produce methyl phosphotriester linkages. Since these linkages are diastereomeric and uncharged, the oligos may be hard to handle. Consequently, it is likely that chimeras will be produced using these monomers along with the regular UltraMild CE phosphoramidites. If many dG residues are included in the oligonucleotide, we recommend the use of phenoxyacetic anhydride (Pac2O) in Cap A. This modification removes the possibility of exchange of the isopropyl-phenoxyacetate (iPr-Pac) protecting group on the dG with acetate from the acetic anhydride capping mix.

| Item | Catalog No. | Pack |
|-------------------------------|-------------|-------|
| Pac-dA-Me Phosphoramidite | 10-1301-02 | 0.25g |
| | 10-1301-05 | 0.5g |
| | 10-1301-10 | 1.0g |
| Ac-dC-Me Phosphoramidite | 10-1315-02 | 0.25g |
| | 10-1315-05 | 0.5g |
| | 10-1315-10 | 1.0g |
| iPr-Pac-dG-Me Phosphoramidite | 10-1321-02 | 0.25g |
| | 10-1321-05 | 0.5g |
| | 10-1321-10 | 1.0g |
| dT-Me Phosphoramidite | 10-1330-02 | 0.25g |
| | 10-1330-05 | 0.5g |
| | 10-1330-10 | 1.0g |

ULTRAMILD SOLVENTS/REAGENTS

| Item | Catalog No. | Pack |
|---|-------------|-------|
| <i>Cap Mix A</i> THF/Pyridine/Pac ₂ O (Applied Biosystems) | 40-4210-52 | 200mL |
| | 40-4210-57 | 450mL |
| THF/Pac ₂ O (Expedite) | 40-4212-52 | 200mL |
| | 40-4212-57 | 450mL |
| <i>Deprotection Solution</i> 0.05M Potassium Carbonate in Methanol | 60-4600-30 | 30mL |
| | 60-4600-52 | 200mL |
| | 60-4600-57 | 30mL |
| | | 450mL |
|  | | |
|  | | |
|  | | |
|  | | |

H-PHOSPHONATE MONOMERS

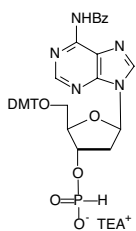
Our H-Phosphonate line has been discontinued. Please contact Glen Support.

| Item | Catalog No. | Pack |
|----------------------------|-------------|--------------|
| dA-H-Phosphonate, TEA Salt | 10-1200 | Discontinued |
| dC-H-Phosphonate, DBU Salt | 10-1210 | Discontinued |
| dG-H-Phosphonate, TEA Salt | 10-1220 | Discontinued |
| dT-H-Phosphonate, TEA Salt | 10-1230 | Discontinued |

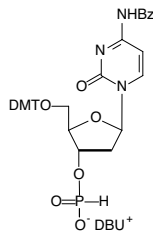
H-PHOSPHONATE REAGENTS

Our H-Phosphonate solvents and reagents have been discontinued. H-Phosphonate reagents are easily prepared using high purity products and the formulations shown below.

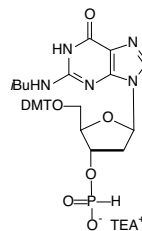
| Item |
|---|
| 1-Adamantanecarbonyl chloride is available from Aldrich, Catalog No. 117722. Dilute to 0.1M. <i>(Activator for monomers and capping reagent)</i> |
| Acetonitrile/Pyridine (50:50), anhydrous <i>(Monomer Diluent)</i> |
| Acetonitrile/Pyridine (95:5), anhydrous <i>(Activator Diluent)</i> |
| 1% Isopropyl Phosphite in Acetonitrile/Pyridine (50:50) <i>(Capping Reagent)</i> |
| Acetonitrile/Pyridine (50:50) <i>(Neutralizer and Wash Solvent)</i> |
| 4% I ₂ in Pyridine/H ₂ O/THF (10:10:80) THF/H ₂ O/TEA (80:10:10) <i>(Both reagents are required for oxidation of H-phosphonate linkages)</i> |



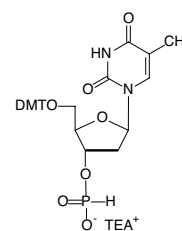
dA-H-Phosphonate



dC-H-Phosphonate



dG-H-Phosphonate



dT-H-Phosphonate

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

ABBREVIATIONS

I₂ = Iodine
TEA = Triethylamine
THF = Tetrahydrofuran

LOCKED ANALOG PHOSPHoramidites AND SUPPORTS

REFERENCES

- (1a) A.A. Koshkin, S.K. Singh, P. Nielsen, V.K. Rajwanshi, R. Kumar, M. Meldgaard, C.E. Olsen, and J. Wengel, *Tetrahedron*, 1998, **54**, 3607-3630.
- (1b) S.K. Singh, P. Nielsen, A.A. Koshkin, and J. Wengel, *Chem. Comm.*, 1998, (4), 455-456.
- (2) L. Kværno and J. Wengel, *Chem. Comm.*, 1999, (7), 657-658.
- (3) P. Mouritzen, A.T. Nielsen, H.M. Pfundheller, Y. Choleva, L. Kongsbak, and S. Møller, *Expert Review of Molecular Diagnostics*, 2003, **3**(1), 27-38.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

For Instrument type *Add*

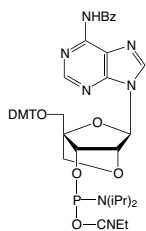
Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

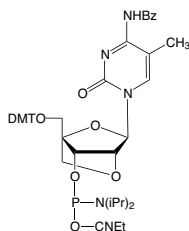
Locked Nucleic Acid (LNA) was first described by Wengel and co-workers in 1998¹ as a novel class of conformationally restricted oligonucleotide analogues. LNA is a bicyclic nucleic acid where a ribonucleoside is linked between the 2'-oxygen and the 4'-carbon atoms with a methylene unit. Oligonucleotides containing LNA exhibit unprecedented thermal stabilities towards complementary DNA and RNA², which allows excellent mismatch discrimination. In fact, the high binding affinity of LNA oligos allows for the use of short probes in, for example, SNP genotyping³, allele specific PCR and mRNA sample preparation. LNA is recommended for use in any hybridization assay that requires high specificity and/or reproducibility, e.g., dual labelled probes, in situ hybridization probes, molecular beacons and PCR primers. Furthermore, LNA offers the possibility to adjust T_m values of primers and probes in multiplex assays. LNA can be mixed with DNA and RNA, as well as other nucleic acid analogues, modifiers and labels. LNA oligonucleotides are water soluble, and can be separated by gel electrophoresis and precipitated by ethanol.

Glen Research is pleased to offer these highly useful reagents - Locked Analog (LA) Phosphoramidites and Supports - as tools for this technology.

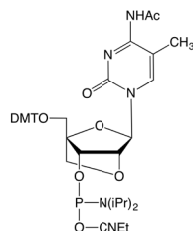
| Item | Catalog No. | Pack |
|---------------------------------|--------------------------|---------------|
| Bz-A-LA-CE Phosphoramidite | 10-2000-05 10-2000-10 | 0.5g 1.0g |
| Pac-A-LA-CE Phosphoramidite | 10-2601-05 10-2601-10 | 0.25g 0.5g |
| 5-Me-Bz-C-LA-CE Phosphoramidite | 10-2011-05 10-2011-10 | 0.5g 1.0g |
| Ac-5-Me-C-LA-CE Phosphoramidite | 10-2015-05 10-2015-10 | 0.5g 1.0g |
| dmf-G-LA-CE Phosphoramidite | 10-2029-05 10-2029-10 | 0.5g 1.0g |
| iPr-Pac-G-LA-CE Phosphoramidite | 10-2621-02 10-2621-05 | 0.25g 0.5g |
| T-LA-CE Phosphoramidite | 10-2030-05 10-2030-10 | 0.5g 1.0g |



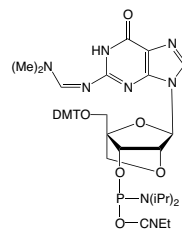
Bz-A-LA



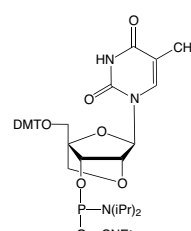
5-Me-Bz-C-LA



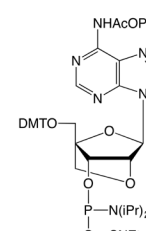
Ac-5-Me-C-LA



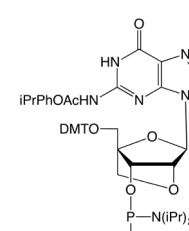
dmf-G-LA



T-LA



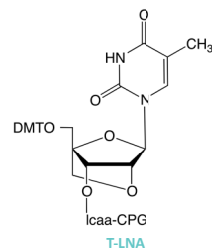
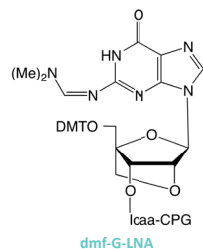
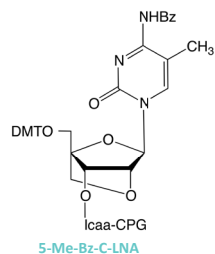
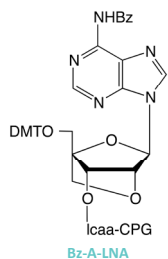
Pac-A-LA



iPr-Pac-G-LA

BACKBONE MODIFICATION

| Item | Catalog No. | Pack | |
|------------------|---------------------------------|------------|-----------|
| Bz-A-LA-CPG | 20-2501-01 | 0.1g | |
| | 20-2501-02 | 0.25g | |
| | 20-2501-10 | 1.0g | |
| | 1 μ mole columns | 20-2501-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-2501-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-2501-13 | Pack of 1 |
| | 15 μ mole column (Expedite) | 20-2501-14 | Pack of 1 |
| Bz-5-Me-C-LA-CPG | 20-2511-01 | 0.1g | |
| | 20-2511-02 | 0.25g | |
| | 20-2511-10 | 1.0g | |
| | 1 μ mole columns | 20-2511-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-2511-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-2511-13 | Pack of 1 |
| | 15 μ mole column (Expedite) | 20-2511-14 | Pack of 1 |
| dmf-G-LA-CPG | 20-2529-01 | 0.1g | |
| | 20-2529-02 | 0.25g | |
| | 20-2529-10 | 1.0g | |
| | 1 μ mole columns | 20-2529-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-2529-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-2529-13 | Pack of 1 |
| | 15 μ mole column (Expedite) | 20-2529-14 | Pack of 1 |
| T-LA-CPG | 20-2531-01 | 0.1g | |
| | 20-2531-02 | 0.25g | |
| | 20-2531-10 | 1.0g | |
| | 1 μ mole columns | 20-2531-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-2531-42 | Pack of 4 |
| | 15 μ mole column (Expedite) | 20-2531-14 | Pack of 1 |
| | 10 μ mole column (ABI) | 20-2531-13 | Pack of 1 |



BETA-L-DNA MONOMERS

beta L-DNA is the mirror image version of naturally occurring D-DNA. L-DNA and D-DNA share identical structures that differ only in terms of stereochemistry and generally have identical physical and chemical properties. The difference in their stereochemistry results in differences in their interactions with chiral molecules, D-DNA will only bind to its D-DNA complement to form right-handed helices, and likewise, L-DNA will only bind to its L-DNA complement to form left-handed helices. For this reason, enzymes that interact with D-DNA, including nucleases, typically won't interact with L-DNA. The unique properties of L-DNAs have made them attractive for many biological applications such as Aptamers, Molecular Beacons, Molecular Tagging, and Drug Nanocarriers. Note that the procedure for synthesizing L-DNA oligonucleotides is very similar to that of D-DNA oligonucleotides. Please see our Glen Report version 31.2 for more details.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

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RELATED

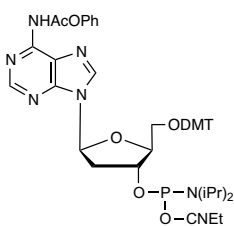
2'-OMe-RNA
Thiophosphoramidites..... 39

| Item | Catalog No. | Pack |
|---|-------------|-------|
| beta-L-Pac-dA-CE Phosphoramidite | 10-2101-02 | 0.25g |
| | 10-2101-05 | 0.5g |
| | 10-2101-10 | 1.0g |
| beta-L-Ac-dC-CE Phosphoramidite | 10-2115-02 | 0.25g |
| | 10-2115-05 | 0.5g |
| | 10-2115-10 | 1.0g |
| beta-L- <i>i</i> Pr-Pac-dG-CE Phosphoramidite | 10-2121-02 | 0.25g |
| | 10-2121-05 | 0.5g |
| | 10-2121-10 | 1.0g |
| beta-L-dT-CE Phosphoramidite | 10-2130-02 | 0.25g |
| | 10-2130-05 | 0.5g |
| | 10-2130-10 | 1.0g |

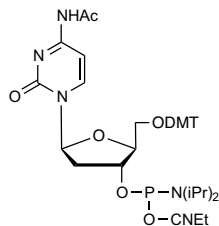
SPIROCYCLOPROPYLENE BRIDGED NUCLEIC ACID (scpBNA™)

Spirocyclopropylene bridged nucleic acid (scpBNA™) is a tricyclic analog of locked nucleic acid (LNA). scpBNA exhibits high binding affinity as well as excellent metabolic stability, and these properties make scpBNA an excellent sugar modification for therapeutic applications.

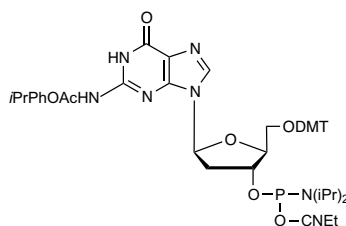
| Item | Catalog No. | Pack |
|-----------------------------------|-------------|-----------|
| 5-Me-C-scpBNA™-CE Phosphoramidite | 10-2211-90 | 100 μmole |
| | 10-2211-01 | 0.25g |
| T-scpBNA™-CE Phosphoramidite | 10-2230-90 | 100 μmole |
| | 10-2230-01 | 0.25g |



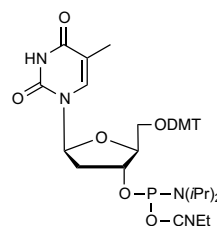
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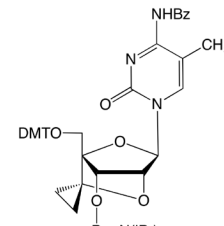
beta-L-Ac-dC



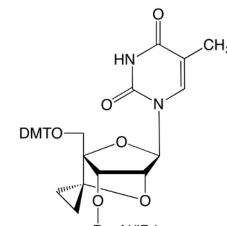
beta-L-*i*Pr-dG



beta-L-dT



5-Me-C-scpBNA



T-scpBNA

SERINOL PHOSPHoramidites

Serinol nucleic acid (SNA) is an acyclic phosphodiester backbone based on serinol (2-amino-1,3-propanediol). It shares the same three carbon skeleton as ribose and has nucleobases that are one atom further away from the skeleton than standard nucleic acids. SNA hybridizes to both DNA and RNA.

| Item | Catalog No. | Pack |
|------------------------------|--------------------------|---------------|
| A-Serinol-CE Phosphoramidite | 10-2390-02 10-2390-05 | 0.25g 0.5g |
| C-Serinol-CE Phosphoramidite | 10-2391-02 10-2391-05 | 0.25g 0.5g |
| A-Serinol-CE Phosphoramidite | 10-2392-02 10-2392-05 | 0.25g 0.5g |
| A-Serinol-CE Phosphoramidite | 10-2393-02 10-2393-05 | 0.25g 0.5g |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

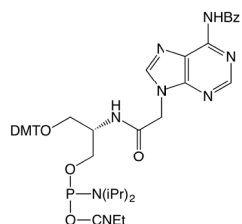
| | |
|----------|---|
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| MerMade | M |

Columns

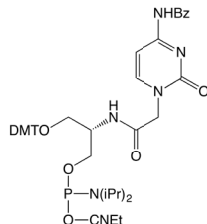
For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

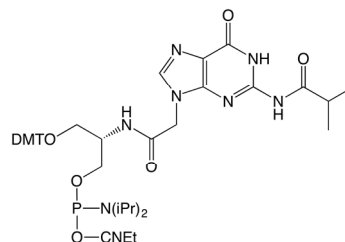
(Please inquire for availability of vials and columns for other instrument types.)



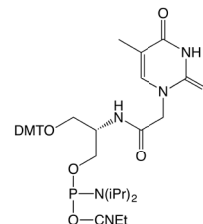
A-Serinol



C-Serinol



G-Serinol

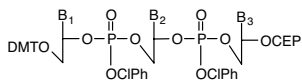


T-Serinol

TRIMER PHOSPHORAMIDITES

REFERENCES

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General Structure of Trimer Phosphoramidites, where B=A^{3'}, C^{3'}, G^{3'}, T

Trimer phosphoramidites¹⁻⁴ have proven to be extremely valuable because they allow codon-based mutagenesis, which circumvents the common problems of codon-bias, frame-shift mutations, and the introduction of nonsense or stop codons.⁵ This is accomplished by introducing a mixture of all 20 amino acid codons (or subset thereof) at any location within the sequenced to be mutated. This leads to the production of clonal libraries of exceptional diversity with order-of-magnitude increases in amino acid sequence variance while either maintaining a uniform amino acid distribution⁶ or one that is biased toward a desired set of amino acids.⁷

However, difficulties arise when trying to introduce mutations in multiple distal regions of a gene simultaneously. The synthesis of long oligonucleotides is required, which inevitably leads to lower sequence fidelity due to deletion mutants, depurination events and, to a lesser extent, mutations arising from deamination of cytidine, for example.

An elegant solution to this problem is the use of Antisense Trimer Phosphoramidites. These trimers are the reverse complement of the canonical 'sense' codons. When these antisense codons are put into the noncoding strand of a template DNA and amplified by PCR, they will code for the sense codon in the opposite strand of DNA. This allows the powerful technique of PCR Assembly⁸ to generate not only kilobase-sized genes from short 50mer oligonucleotides, but to simultaneously mutate multiple distal regions of that gene, as shown in Figure 1.

The sense and their corresponding antisense codons are listed in Table 1. Conveniently, many of our existing sense trimers can act as antisense codons. For example, AAC, which codes for asparagine, has the anticodon GTT, which is the sense codon for valine. However, some of the existing trimers, while they can act as an antisense codon, are not good choices for use. For example, TGG, which codes for tryptophan, could be used as an antisense codon for proline because CCA is one of proline's synonymous codons. However, CCA has a relatively low Codon Adaptation Index (CAI) value⁹ in *E. coli*, which could limit protein expression in that commonly used organism. For this reason, the anticodon CGG was chosen for optimal expression in *E. coli*, as were the other new antisense codons shown in bold in Table 1.

Included in Table 1 are the reaction factors (RFs) for each of the sense and antisense trimers. The reaction factor is critical since the trimers will likely be mixed and they exhibit different rates of reaction when coupling during oligonucleotide synthesis. An example where the RF is used to compensate for differing rates of coupling follows. The RF for AAC is 1.0 and for TAC is 1.6. Therefore, 1.6 equivalents of TAC are needed for every 1.0 equivalent of AAC for equal coupling rates. So to obtain 25 umoles of trimer mix that yields, on average, a 1:1 ratio of AAC/TAC at the mutation site, 9.6 umoles of AAC would be added to 15.4 umoles of TAC.

All of the trimers are available individually so the researchers can prepare custom trimer mixes. Two pre-made catalog trimer mixes are available: 13-1991-xx, for incorporating all 20 amino acid codons equally into a sequence and 13-1992-xx, for incorporating 19 amino acid codons (-Cys). For a custom trimer mix of a particular subset of codons or a trimer mix that represents a set of trimers that is biased toward a particular codon or codons, please contact support@glenresearch.com for a quotation and projected delivery date.

There is a concern that the sequence of the trimers has to be verified. For example, CAT coding for histidine, has to be differentiated from TAC, coding for tyrosine. These two trimers have virtually identical lipophilicity and their identity cannot be clearly confirmed by HPLC. This problem has been solved⁴ using HPLC electrospray mass spectrometric analysis of the trimers, which provides data confirming molecular weight and sequence.

Figure 1: Simultaneous Mutation of Multiple Distal Regions of Gene

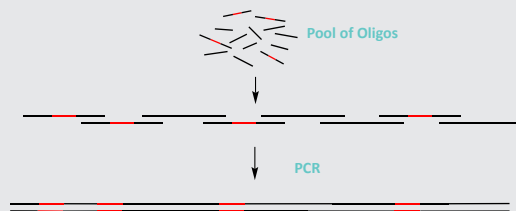
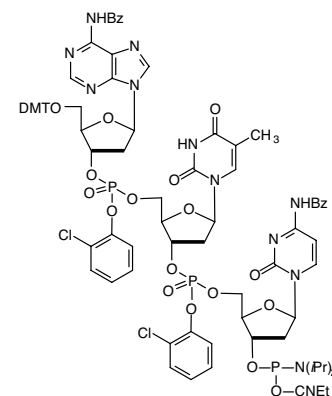


TABLE 1: RF of Trimer Phosphoramidites

| <i>Sense codons (5'→3')</i> | <i>Reaction Factor (RF)</i> | <i>Antisense codons (5'→3')</i> | <i>Reaction Factor (RF)</i> |
|---------------------------------|---------------------------------|-------------------------------------|---------------------------------|
| AAA (Lys) | 1.10 | TTT | 1.70 |
| AAC (Asn) | 1.00 | GTT | 1.90 |
| ACT (Thr) | 1.60 | GGT | 1.10 |
| ATC (Ile) | 1.50 | GAT | 1.40 |
| ATG (Met) | 1.30 | CAT | 1.30 |
| CAG (Gln) | 2.00 | CTG | 1.20 |
| CAT (His) | 1.30 | ATG | 1.30 |
| CCG (Pro) | 1.80 | CGG | 0.80 |
| CGT (Arg) | 1.40 | GCG | 0.60 |
| CTG (Leu) | 1.20 | CAG | 2.00 |
| GAA (Glu) | 1.40 | TTC | 1.30 |
| GAC (Asp) | 1.60 | ATC | 1.50 |
| GCT (Ala) | 1.50 | TGC | 1.50 |
| GGT (Gly) | 1.10 | ACC | 0.90 |
| GTT (Val) | 1.90 | AAC | 1.00 |
| TAC (Tyr) | 1.60 | GTA | 1.50 |
| TCT (Ser) | 1.30 | AGA | 1.40 |
| TGC (Cys) | 1.50 | GCA | 1.00 |
| TGG (Trp) | 1.10 | CCA | 1.10 |
| TTC (Phe) | 1.30 | GAA | 1.40 |



ATC Trimer

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

| Item | Catalog No. | Pack |
|--|--------------------------|-----------------|
| <i>Sense Trimers</i> | | |
| AAA Trimer Phosphoramidite (<i>Lys</i>) | 13-1000-95 13-1000-90 | 50 µm 100 µm |
| AAC Trimer Phosphoramidite (<i>Asn</i>) | 13-1001-95 13-1001-90 | 50 µm 100 µm |
| ACT Trimer Phosphoramidite (<i>Thr</i>) | 13-1013-95 13-1013-90 | 50 µm 100 µm |
| AGC Trimer Phosphoramidite (<i>Ser</i>) | 13-1021-95 13-1021-90 | 50 µm 100 µm |
| ATC Trimer Phosphoramidite (<i>Ile</i>) | 13-1031-95 13-1031-90 | 50 µm 100 µm |
| ATG Trimer Phosphoramidite (<i>Met</i>) | 13-1032-95 13-1032-90 | 50 µm 100 µm |
| CAG Trimer Phosphoramidite (<i>Gln</i>) | 13-1102-95 13-1102-90 | 50 µm 100 µm |
| CAT Trimer Phosphoramidite (<i>His</i>) | 13-1103-95 13-1103-90 | 50 µm 100 µm |
| CCG Trimer Phosphoramidite (<i>Pro</i>) | 13-1112-95 13-1112-90 | 50 µm 100 µm |
| CGT Trimer Phosphoramidite (<i>Arg</i>) | 13-1123-95 13-1123-90 | 50 µm 100 µm |
| CTG Trimer Phosphoramidite (<i>Leu</i>) | 13-1132-95 13-1132-90 | 50 µm 100 µm |
| GAA Trimer Phosphoramidite (<i>Glu</i>) | 13-1200-95 13-1200-90 | 50 µm 100 µm |
| GAC Trimer Phosphoramidite (<i>Asp</i>) | 13-1201-95 13-1201-90 | 50 µm 100 µm |
| GCT Trimer Phosphoramidite (<i>Ala</i>) | 13-1213-95 13-1213-90 | 50 µm 100 µm |
| GGT Trimer Phosphoramidite (<i>Gly</i>) | 13-1223-95 13-1223-90 | 50 µm 100 µm |
| GTT Trimer Phosphoramidite (<i>Val</i>) | 13-1233-95 13-1233-90 | 50 µm 100 µm |
| TAC Trimer Phosphoramidite (<i>Tyr</i>) | 13-1301-95 13-1301-90 | 50 µm 100 µm |
| TCT Trimer Phosphoramidite (<i>Ser</i>) | 13-1313-95 13-1313-90 | 50 µm 100 µm |
| TGC Trimer Phosphoramidite (<i>Cys</i>) | 13-1321-95 13-1321-90 | 50 µm 100 µm |
| TGG Trimer Phosphoramidite (<i>Trp</i>) | 13-1322-95 13-1322-90 | 50 µm 100 µm |
| TTC Trimer Phosphoramidite (<i>Phe</i>) | 13-1331-95 13-1331-90 | 50 µm 100 µm |

| Item | Catalog No. | Pack |
|--|--------------------------|-----------------|
| <i>Antisense Trimers</i> | | |
| AAC Trimer Phosphoramidite (<i>Anti Val</i>) | 13-1001-95 13-1001-90 | 50 µm 100 µm |
| ACC Trimer Phosphoramidite (<i>Anti Gly</i>) | 13-1011-95 13-1011-90 | 50 µm 100 µm |
| AGA Trimer Phosphoramidite (<i>Anti Ser</i>) | 13-1020-95 13-1020-90 | 50 µm 100 µm |
| ATC Trimer Phosphoramidite (<i>Anti Asp</i>) | 13-1031-95 13-1031-90 | 50 µm 100 µm |
| ATG Trimer Phosphoramidite (<i>Anti His</i>) | 13-1032-95 13-1032-90 | 50 µm 100 µm |
| CAG Trimer Phosphoramidite (<i>Anti Leu</i>) | 13-1102-95 13-1102-90 | 50 µm 100 µm |
| CAT Trimer Phosphoramidite (<i>Anti Met</i>) | 13-1103-95 13-1103-90 | 50 µm 100 µm |
| CCA Trimer Phosphoramidite (<i>Anti Trp</i>) | 13-1110-95 13-1110-90 | 50 µm 100 µm |
| CGG Trimer Phosphoramidite (<i>Anti Pro</i>) | 13-1122-95 13-1122-90 | 50 µm 100 µm |
| GAA Trimer Phosphoramidite (<i>Anti Phe</i>) | 13-1200-95 13-1200-90 | 50 µm 100 µm |
| GAT Trimer Phosphoramidite (<i>Anti Ile</i>) | 13-1203-95 13-1203-90 | 50 µm 100 µm |
| GCA Trimer Phosphoramidite (<i>Anti Cys</i>) | 13-1210-95 13-1210-90 | 50 µm 100 µm |
| GCG Trimer Phosphoramidite (<i>Anti Arg</i>) | 13-1212-95 13-1212-90 | 50 µm 100 µm |
| GGT Trimer Phosphoramidite (<i>Anti Thr</i>) | 13-1223-95 13-1223-90 | 50 µm 100 µm |
| GTA Trimer Phosphoramidite (<i>Anti Tyr</i>) | 13-1230-95 13-1230-90 | 50 µm 100 µm |
| TGC Trimer Phosphoramidite (<i>Anti Ala</i>) | 13-1321-95 13-1321-90 | 50 µm 100 µm |
| TTC Trimer Phosphoramidite (<i>Anti Glu</i>) | 13-1331-95 13-1331-90 | 50 µm 100 µm |
| TTT Trimer Phosphoramidite (<i>Anti Lys</i>) | 13-1333-95 13-1333-90 | 50 µm 100 µm |
| Trimer Phosphoramidite Mix 1 (Mix of above 20 trimers) | 13-1991-95 13-1991-90 | 50 µm 100 µm |
| Trimer Phosphoramidite Mix 2 (Mix of above 20 trimers less TGC-Cys) | 13-1992-95 13-1992-90 | 50 µm 100 µm |

BASES AFFECTING DUPLEX STABILITY

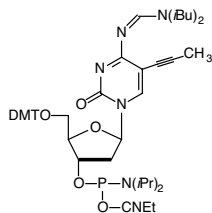
Substitution of C-5 propynyl-dC (pdC) for dC and C-5 propynyl-dU (pdU) for dT are effective strategies to enhance base pairing. Using these base substitutions, duplex stability and melting temperatures are raised by the following amounts: C-5 propynyl-C 2.8° per substitution; C-5 propynyl-U 1.7° per substitution. AP-dC (G-clamp) substitutes for dC and is another very important modified nucleoside that enhances hybridization by 7-21° per substitution depending upon the sequence and location of the AP-dC. The ability of these modified bases to enhance binding while maintaining specificity has proven useful in antisense research and in the synthesis of high affinity probes. AP-dC is also a fluorescent nucleoside and should find uses in DNA structural research.

dW is a C-nucleoside that acts as a strong adenine base pairing analog. In addition to the typical two hydrogen bonds found between T and A, dW can also interact with A via van der Waals forces. The result is a dW-A interaction that approaches the strength of a C-G base pair while also exhibiting enhanced base-pairing fidelity. dW can be used in place of T as a single substitution or a complete replacement for oligonucleotide hybridization applications.

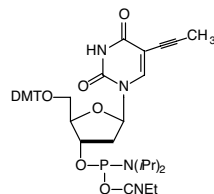
| Item | Catalog No. | Pack |
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| | 10-1014-02 | 0.25g |
| | 10-1014-05 | 0.5g |
| pdU-CE Phosphoramidite | 10-1054-90 | 100 µmole |
| | 10-1054-02 | 0.25g |
| | 10-1054-05 | 0.5g |
| AP-dC-CE Phosphoramidite (G-Clamp) | 10-1097-95 | 50 µmole |
| | 10-1097-90 | 100 µmole |
| | 10-1097-02 | 0.25g |
| dW-CE Phosphoramidite | 10-1527-95 | 50 µmole |
| | 10-1527-90 | 100 µmole |
| | 10-1527-02 | 0.25g |

C-5 methyl pyrimidine nucleosides are known to stabilize duplexes relative to the non-methylated bases. Therefore, enhanced binding can be achieved using 5-methyl-dC in place of dC, duplex melting temperature being increased by 1.3°. Ac-5-Me-dC-CE Phosphoramidite is fully compatible with AMA deprotection and none of the N4-Me transamination mutant is observed on deprotection.

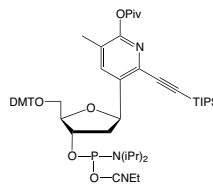
| Item | Catalog No. | Pack |
|-------------------------------|-------------|-----------|
| 5-Me-dC-CE Phosphoramidite | 10-1060-90 | 100 µmole |
| | 10-1060-02 | 0.25g |
| Ac-5-Me-dC-CE Phosphoramidite | 10-1560-90 | 100 µmole |
| | 10-1560-02 | 0.25g |



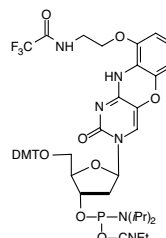
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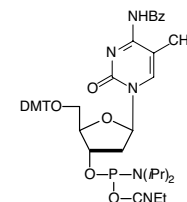
pdU



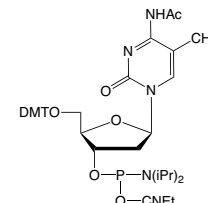
dW



AP-dC



5-Me-dC



Ac-5-Me-dC

BASES AFFECTING DUPLEX STABILITY (CONT.)

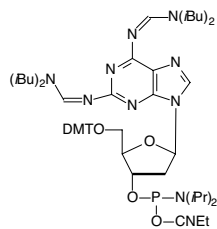
The simplest approach to the design of high affinity primers and probes is to substitute A sites with 2-amino-A, since the 2-amino-A-T base pair is equivalent in strength to the G-T base pair. 2-Amino-A also destabilizes A-G wobble mismatches, thus increasing specificity. In 1998, we introduced a 2-amino-dA monomer which exhibits fast and effective deprotection in ammonium hydroxide and it is stabilized to depurination during synthesis. We now recommend the use of 0.5 M CSO in anhydrous acetonitrile (40-4632-xx) for best results with multiple additions of 2-amino-dA. This is because the bis formamidate protected 2-amino-dA leads to significant strand scission when standard iodine oxidation is used during synthesis. For this reason, we have also added Pac-2-Amino-dA, a monomer with optimized protection to meet the following criteria: stable during oligonucleotide synthesis, oxidation, and detritylation; labile towards common deprotection conditions (NH₃, AMA, MeNH₂); and the nucleobase protecting groups are cleaved under fairly mild conditions.

| Item | Catalog No. | Pack |
|--|-------------|-----------|
| 2-Amino-dA-CE Phosphoramidite (2,6-diaminopurine) | 10-1085-95 | 50 μmole |
| | 10-1085-90 | 100 μmole |
| | 10-1085-02 | 0.25g |
| Pac-2-Amino-dA-CE Phosphoramidite (2,6-diaminopurine) | 10-1585-95 | 50 μmole |
| | 10-1585-90 | 100 μmole |
| | 10-1585-02 | 0.25g |

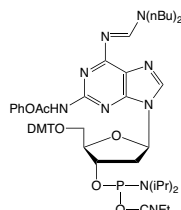
Sequences with high GC content may contain mismatches and still hybridize because of the high stability of the G-C base pair. The N4-ethyl analogue of dC (N4-Et-dC) hybridizes specifically to natural dG but the stability of the base pair is reduced to about the level of an AT base pair.

Coupling N6-Me-dA (10-1003) and N4-Et-dC (10-1068) with 1H-tetrazole leads to a trace of branching at the secondary amine positions, while DCI leads to around 15% branching. In collaboration with Berry and Associates, the acetyl protected monomers were prepared. Acetyl protection was chosen since it would block branching reactions. Oligonucleotides synthesized using these monomers proved to be compatible with all popular deprotection strategies from UltraMild to UltraFast. When the acetyl protected monomers were compared with the unprotected monomers using DCI as activator, branching was reduced from 15% to zero.

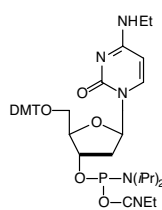
| Item | Catalog No. | Pack |
|-----------------------------------|-------------|-----------|
| N4-Et-dC-CE Phosphoramidite | 10-1068-95 | 50 μmole |
| | 10-1068-90 | 100 μmole |
| | 10-1068-02 | 0.25g |
| N4-Ac-N4-Et-dC-CE Phosphoramidite | 10-1513-95 | 50 μmole |
| | 10-1513-90 | 100 μmole |
| | 10-1513-02 | 0.25g |
| N6-Me-dA-CE Phosphoramidite | 10-1003-90 | 100 μmole |
| | 10-1003-02 | 0.25g |
| N6-Ac-N6-Me-dA-CE Phosphoramidite | 10-1503-90 | 100 μmole |
| | 10-1503-02 | 0.25g |



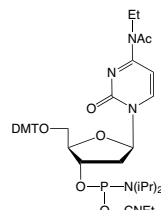
2-Amino-dA



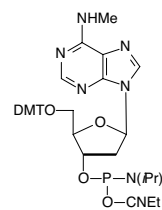
Pac-2-Amino-dA



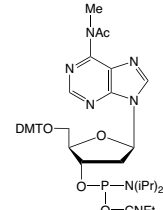
N4-Et-dC



N4-Ac-N4-Et-dC



N6-Me-dA



N6-Ac-N6-Me-dA

RELATED

| | |
|---------------|----|
| 0.5M CSO..... | 36 |
| N6-Me-dA..... | 39 |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

ZIP NUCLEIC ACIDS (ZNA®)

INTELLECTUAL PROPERTY

"Spermine phosphoramidite" synthesis is the subject matter of U.S. Divisional Patent Application No. 14/745,871, European Patent No. 1973927 and foreign equivalents for which Polyplus-transfection is the co-owner. Product is sold for research purposes only. Product shall not be used to manufacture oligospermine-oligonucleotide conjugates for use in diagnostics, clinical or commercial applications including use in humans. There is no implied license to manufacture oligospermine-oligonucleotide conjugates for diagnostic, clinical, or commercial applications, including but not limited to contract research. Please contact Polyplus-transfection at licensing@polyplus-transfection.com to obtain a license for such use.

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RELATED

| | |
|----------------------|----|
| 2-Amino-dA | 53 |
| Pac-2-Amino-dA | 53 |
| 2-Thio-dT | 64 |
| dmf-5-Me-isodC | 59 |
| dmf-isodG | 59 |

Spermine phosphoramidite is used to produce oligospermine-oligonucleotide conjugates - Zip Nucleic Acids (ZNA®) Oligos. The name reflects the presumed mode of action. The conjugates are believed to use the oligospermine to seek out and move along (scan) oligonucleotide strands until the probe complementary sequence is located. The oligospermine then performs the function of stabilizing the formed duplex by reducing electrostatic repulsion, thereby leading to significantly increased binding affinities. ZNA® Oligos have found use in the following applications: Multiplex PCR; PCR of AT-rich Regions; RT qPCR; Detection of MicroRNA; Improved SNP Discrimination; and Antisense and Antigene Effects. Spermine phosphoramidite is simple to use in oligonucleotide synthesis and can be added multiple times at the 3' or 5' terminus. Deprotection and isolation are also straightforward. HPLC analysis of the conjugates requires high pH to suppress the ionization of the spermine residues.

| Item | Catalog No. | Pack |
|--------------------------|-------------|-----------|
| Spermine Phosphoramidite | 10-1939-95 | 50 µmole |
| | 10-1939-90 | 100 µmole |
| | 10-1939-02 | 0.25g |

CDPI₃ MGB™ LABELING

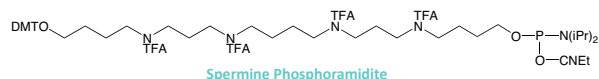
Synthetic oligonucleotides with covalently-attached CDPI₃ have enhanced DNA affinity and improved the hybridization properties of sequence-specific DNA probes. Short CDPI₃-oligonucleotides hybridize with single-stranded DNA to give more stable DNA duplexes than unmodified ODNs of similar length. The simplest approach to MGB probe design is to use an MGB support, add a quencher molecule as the first addition and complete the synthesis with a 5'-fluorophore. Alternatively, a fluorophore support could be used with the 5' terminus containing a quencher molecule followed by a final MGB addition at the 5' terminus. Glen Research offers 5'-CDPI₃ MGB™ Phosphoramidite and 3'-CDPI₃ MGB™ CPG.

SELECTIVELY BINDING COMPLEMENTARY (SBC) OLIGOS

SBC oligos exhibit high affinity for natural oligonucleotides but they show little affinity for other SBC oligos even of a complementary sequence. Oligos in which A has been replaced with 2-amino-A and T with 2-thio-T represent an excellent example of SBC oligos. While 2-amino-A forms a very stable base pair with T containing three hydrogen bonds, the stability of the base pair with 2-thio-T is greatly diminished. However, 2-thio-T base pairs perfectly well with A. As an example, SBC 20mers annealed against a DNA 20mer target exhibited T_m values 10 °C higher than the corresponding DNA-DNA hybrid, whereas the SBC-SBC hybrid yielded T_m values 30 °C lower.

UNNATURAL BASE PAIRS

Unnatural base pairs display unique abilities in duplex DNA and in nucleic acid and protein biosyntheses. A standard Watson and Crick base pair is formed between iso-C and iso-G, but the hydrogen bonding pattern is quite different from the natural base pairs A-T and C-G. Iso-bases can, therefore, increase specificity of nucleic acid hybridization when introduced as a third base pair. It has also been demonstrated that iso-bases 5-Me-iso-dC and iso-dG can function as degenerate pyrimidine and purine bases, respectively. Iso-dG further functioned as a degenerate base opposite B (C, T, and G) ambiguous sites.



CAPS FOR INCREASED DUPLEX STABILITY AND BASE-PAIRING FIDELITY

New cap structures allow for the preparation of hybridization probes with increased affinity for complementary sequences. The monomers used to prepare capped oligonucleotides are phosphoramidites that can be readily introduced via automated DNA synthesis at the end of solid phase syntheses. The caps favor the formation of stable Watson-Crick duplexes by stacking on the terminal base pair (Figures 1 and 2).

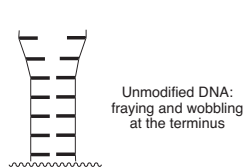


FIGURE 1: STACKING OF CAP ON 5' TERMINAL BASE PAIR

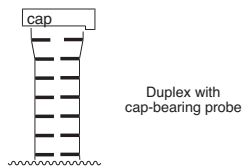
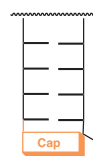


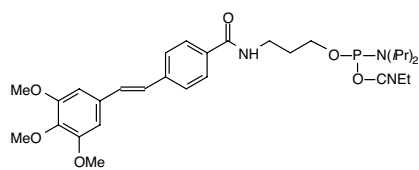
FIGURE 2: STACKING OF Uaq CAP ON 3' TERMINAL BASE PAIR



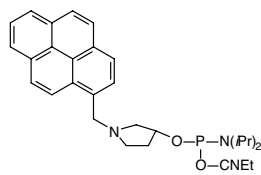
Melting point increases of over 10 °C per modification can be realized for short duplexes.^{1,2} The caps fit canonical Watson-Crick base pairs and do not stack well on mismatched base pairs. This leads to increased base pairing selectivity at the terminal and the penultimate position of oligonucleotides featuring the caps. Base pairing fidelity is usually low at the termini, where fraying occurs frequently in the absence of caps. The beneficial effects of the caps are also realized when longer target strands are bound, so there is no need for blunt ends for the duplexes formed.^{1,2} The caps, when attached to the 5' terminus of an oligonucleotide, also facilitate purification as their lipophilicity leads to prolonged retention on reversed phase columns or cartridges. Finally, capping of termini may discourage the degradation of oligonucleotides by exonucleases.

3'-Uaq Cap CPG, a Uracil support modified with a 2'- anthraquinone residue, is the most effective oligonucleotide cap known to date.^{3,4} For short hybrid duplexes between DNA probes and RNA target strands, the increase in T_m is up to 18 °C and the modification is effective in increasing the T_m of DNA:DNA, RNA:RNA, and DNA:RNA hybrid duplexes. 3'-Uaq Cap also increases probe specificity by depressing the melting point of terminal mismatches.

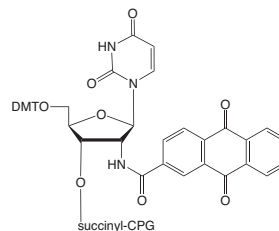
| Item | Catalog No. | Pack |
|---|-------------|-----------|
| 5'-Trimethoxystilbene Cap Phosphoramidite | 10-1986-90 | 100 μmole |
| | 10-1986-02 | 0.25g |
| 5'-Pyrene Cap Phosphoramidite | 10-1987-90 | 100 μmole |
| | 10-1987-02 | 0.25g |
| 3'-Uaq Cap CPG | 20-2980-01 | 0.1g |
| | 20-2980-10 | 1.0g |
| | 20-2980-41 | Pack of 4 |
| | 20-2980-42 | Pack of 4 |
| | 20-2980-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2980-14 | Pack of 1 |



5'-Trimethoxystilbene Cap



5'-Pyrene Cap



3'-Uaq Cap CPG

REFERENCES

- (1) Dogan, Z.; Paulini, R.; Rojas Stütz, J. A.; Narayanan, S.; Richert, C. *J. Amer. Chem. Soc.* **2004**, *126*, 4762-4763.
- (2) Narayanan, S.; Gall, J.; Richert, C. *Nucleic Acids Res.* **2004**, *32*, 2901-2911.
- (3) A. Patra, C. Richert, *J. Amer. Chem. Soc.*, 2009, **131**, 12671-12681.
- (4) C. Ahlborn, K. Siegmund, C. Richert, *J. Amer. Chem. Soc.*, 2007, **129**, 15218-15232.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type Add

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

DNA METHYLATION

RELATED

| | |
|---------------|----|
| 5-Me-dC | 52 |
| 5-hmdU | 67 |

REFERENCES

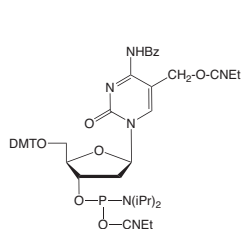
- (1) S. Kraucionis, and N. Heintz, *Science*, 2009, **324**, 929-30.
- (2) M. Tahiliani, et al., *Science*, 2009, **324**, 930-935.
- (3) M. Münzel, et al., *Angewandte Chemie-International Edition*, 2010, **49**, 5375-5377.
- (4) D. Globisch, et al., *PLoS One*, 2010, **5**, e15367.
- (5) S.C. Wu, and Y. Zhang, *Nat Rev Mol Cell Biol*, 2010, **11**, 607-20.
- (6) M. Münzel, D. Globisch, C. Trindler, and T. Carell, *Org Lett*, 2010, **12**, 5671-3.
- (7) A.S. Schroder, et al., *Angewandte Chemie-International Edition*, 2014, **53**, 315-318.

One of the fastest growing fields in biology and cancer research is epigenetics. While the underlying genetic code defines which proteins and gene products are synthesized, it is epigenetic control that defines when and where they are expressed. This dynamic control of gene expression is essential for X chromosome inactivation, embryogenesis, cellular differentiation and appears integral to memory formation and synaptic plasticity.

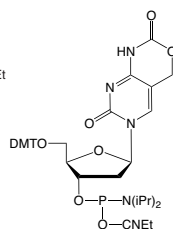
In 2009, two reports^{1,2} described the discovery of 5-hydroxymethyl-2'-deoxyCytidine (hmdC), a novel dC modification in Purkinje neurons and embryonic stem cells. Later, a third report found this modification to be strongly enriched in brain tissues associated with higher cognitive functions.³ This dC modification is generated by the action of α -ketoglutarate dependent ten eleven translocation (TET) enzymes, which oxidizes 5-Me-dC to hmdC. This finding stimulated discussion about active demethylation pathways that could occur, e.g., via base excision repair (BER), with the help of specialized DNA glycosylases. Alternatively, one could envision a process in which the hydroxymethyl group of hmdC is further oxidized to 5-formyl-dC (fdC) or 5-carboxy-dC (cadC) followed by elimination of either formic acid or carbon dioxide^{4,5}.

Glen Research has supported this research since its inception by providing the building blocks for the synthesis of oligonucleotides containing all the new dC derivatives - hmdC, fdC and cadC. The first generation hmdC phosphoramidite was fairly very well accepted but requires fairly harsh deprotection conditions. Therefore, a second generation building block (5-Hydroxymethyl-dC II) developed by Carell and co-workers that is compatible with UltraMild deprotection was introduced.⁶ 5-Formyl-dC III has been designed to meet all of the requirements to prepare an oligo containing all of the methylated variants.⁷

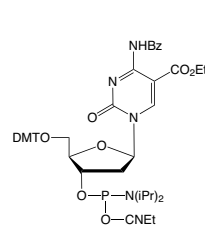
| Item | Catalog No. | Pack |
|--|-------------|----------------|
| 5-Hydroxymethyl-dC-CE Phosphoramidite | 10-1062-95 | 50 μ mole |
| | 10-1062-90 | 100 μ mole |
| | 10-1062-02 | 0.25g |
| 5-Carboxy-dC-CE Phosphoramidite | 10-1066-95 | 50 μ mole |
| | 10-1066-90 | 100 μ mole |
| | 10-1066-02 | 0.25g |
| 5-Formyl-dC-CE Phosphoramidite | 10-1514-95 | 50 μ mole |
| | 10-1514-90 | 100 μ mole |
| | 10-1514-02 | 0.25g |
| 5-Hydroxymethyl-dC II-CE Phosphoramidite | 10-1510-95 | 50 μ mole |
| | 10-1510-90 | 100 μ mole |
| | 10-1510-02 | 0.25g |
| 5-Formyl-dC III-CE Phosphoramidite | 10-1564-95 | 50 μ mole |
| | 10-1564-90 | 100 μ mole |
| | 10-1564-02 | 0.25g |



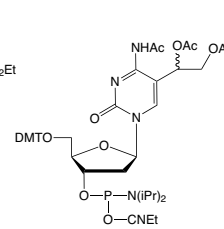
5-Hydroxymethyl-dC



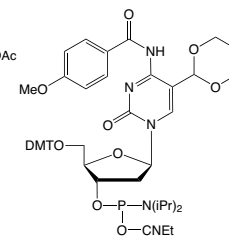
5-Hydroxymethyl-dC II



5-Carboxy-dC



5-Formyl-dC



5-Formyl-dC III

DUPLEX EFFECTS

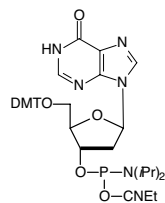
The design of primers is frequently complicated by the degeneracy of the genetic code. Three strategies are now available to confront this problem. In the first, a mixed base addition (N) is used to form the degenerate site. This approach is best if the number of degenerate sites is small. A second option is the use of 2'-deoxyInosine or 2'-deoxyNebularine which exhibit low, but unequal, hydrogen bonding to the other four bases. The third option is the use of a universal nucleoside. In this strategy, the base analog does not hybridize significantly to the other four bases and makes up some of the duplex destabilization by acting as an intercalating agent. 3-Nitropyrrole 2'-deoxynucleoside (M) is the first example of a set of universal bases. Subsequently, 5-nitroindole was determined to be an effective universal base and to be superior to 3-nitropyrrole, based on duplex melting experiments.

The modified bases designated P and K show considerable promise as degenerate bases. The pyrimidine derivative P, when introduced into oligonucleotides, base pairs with either A or G, while the purine derivative K base pairs with either C or T. A dP+dK mix also can serve as a mixed base with much less degeneracy than dA+dC+dG+dT (N).

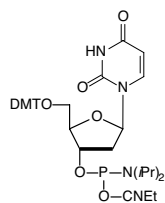
| Item | Catalog No. | Pack |
|---------------------------------|-------------|-------|
| dA+dG-CE Phosphoramidites | 10-1002-02 | 0.25g |
| dC+dT-CE Phosphoramidites | 10-1013-02 | 0.25g |
| dA+dC+dG+dT-CE Phosphoramidites | 10-1023-02 | 0.25g |

Other pack sizes, mixed base combinations and custom doping of individual monomers are available on request. Also, mixed base columns are available in 0.2 and 1.0 μmole sizes on request.

| | | |
|-----------------------|--------------------------|--------------------|
| dI-CE Phosphoramidite | 10-1040-90 10-1040-02 | 100 μmole 0.25g |
| dI-CPG 500 | 20-2040-01 | 0.1g |
| 1 μmole columns | 20-2190-41 | Pack of 4 |
| 0.2 μmole columns | 20-2190-42 | Pack of 4 |
| dI-CPG 1000 | 20-2041-01 | 0.1g |
| 1 μmole columns | 20-2191-41 | Pack of 4 |
| 0.2 μmole columns | 20-2191-42 | Pack of 4 |
| dU-CE Phosphoramidite | 10-1050-90 10-1050-02 | 100 μmole 0.25g |
| dU-CPG 500 | 20-2050-01 | 0.1g |
| 1 μmole columns | 20-2150-41 | Pack of 4 |
| 0.2 μmole columns | 20-2150-42 | Pack of 4 |
| dU-CPG 1000 | 20-2051-01 | 0.1g |
| 1 μmole columns | 20-2151-41 | Pack of 4 |
| 0.2 μmole columns | 20-2151-42 | Pack of 4 |



2'-deoxyInosine



2'-deoxyUridine

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

| Monomers | |
|-------------------------|-----|
| For Instrument type | Add |
| Expedite | E |
| MerMade | M |
| Columns | |
| For Instrument type | Add |
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

DUPLEX EFFECTS (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

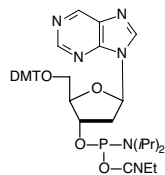
Columns

For Instrument type *Add*

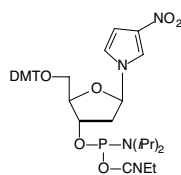
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

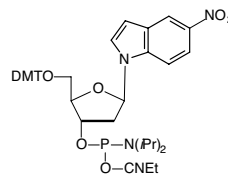
| Item | Catalog No. | Pack |
|--|--------------------------|--------------------|
| 2'-DeoxyNebularine-CE Phosphoramidite (Purine) | 10-1041-90 10-1041-02 | 100 µmole 0.25g |
| 5-Nitroindole-CE Phosphoramidite | 10-1044-90 10-1044-02 | 100 µmole 0.25g |
| dP-CE Phosphoramidite | 10-1047-90 10-1047-02 | 100 µmole 0.25g |
| dK-CE Phosphoramidite | 10-1048-90 10-1048-02 | 100 µmole 0.25g |
| dP+dK-CE Phosphoramidite | 10-1049-90 10-1049-02 | 100 µmole 0.25g |



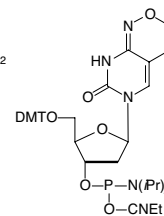
2'-deoxyNebularine



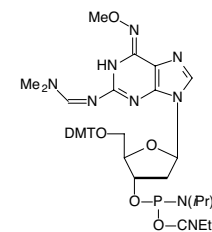
3-Nitropyrrrole



5-Nitroindole



dP



dK

DUPLEX EFFECTS (CONT.)

Unnatural base pairs display unique abilities in duplex DNA and in nucleic acid and protein biosyntheses. A standard Watson and Crick base pair is formed between iso-C and iso-G, but the hydrogen bonding pattern is quite different from the natural base pairs A-T and C-G. (The 5-methyl analogue was chosen as the synthetic target due to the reported instability of 2'-deoxyisocytidine caused by deamination during oligonucleotide synthesis or deprotection.)

RELATED

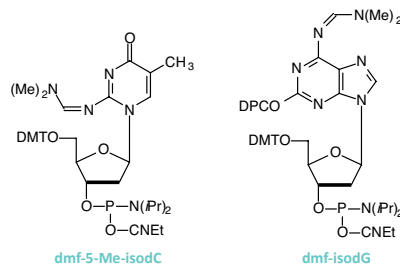
| | |
|---------------------|----|
| N4-Et-dC..... | 53 |
| N4-Ac-N4-Et-dC..... | 53 |

| Item | Catalog No. | Pack |
|-----------------------------------|--------------------------|-------------------------|
| dmf-5-Me-isodC-CE Phosphoramidite | 10-1065-90 10-1065-02 | 100 μ mole 0.25g |
| dmf-isodG-CE Phosphoramidite | 10-1078-90 10-1078-02 | 100 μ mole 0.25g |

T_m MODULATION

Any technique that involves hybridization of multiple sequences simultaneously, as in DNA chip and reverse hybridization technologies, is subject to inaccuracies due to differences in GC content. Sequences with high GC content may contain mismatches and still hybridize, whereas a low GC content probe may match perfectly and yet disassociate from the target, leading to false positives and negatives, respectively.

An elegant way of circumventing this problem would be to use a modified base that normalized the stability of the GC and AT base pairs. The N4-ethyl analogue (N4-Et-dC) hybridizes specifically to natural dG but the stability of the base pair is reduced to about the level of an AT base pair. In a series of probes whose GC content ranged from 0 to 100%, the range in T_m values when N4-Et-dC was used was only 7 °C; when dC was used, that range was 39 °C.



CLEANAMP® MONOMERS

RELATED

UltraMild DNA Synthesis 27

INTELLECTUAL PROPERTY

CleanAmp® is a trademark of TriLink BioTechnologies, Inc. CleanAmp® products or portions thereof are covered by TriLink pending Patent Applications, US 2007281308 and WO2007139723, US Provisional Patent Application Serial # 61/056, 324 and US Patent 6762298 licensed from the Department of Health and Human Services. CleanAmp® products are sold exclusively for R & D use by the purchaser. They may not be resold, distributed or re-packaged. No license is granted or implied with the purchase of this product. Amplification methods used in connection with Polymerase Chain Reaction ("PCR") Process are covered by many patents. It may be necessary to obtain a separate license for certain patented applications in which the product is used. CleanAmp® Licenses are available directly from TriLink BioTechnologies. www.trilinkbiotech.com

CleanAmp® Primers offer an alternative to other Hot Start technologies and allow greater control of primer hybridization and extension during PCR. It has been demonstrated that CleanAmp® Primers outperform other technologies in multiple applications. Indeed, over a broad range of applications, CleanAmp® Primers reduce or eliminate off-target amplification. Greater amplicon yield is also achieved, due to improvement in specificity and sensitivity. By using either the slow-releasing Precision primers with two CleanAmp® phosphotriester linkages or the faster-releasing Turbo Primers with a single CleanAmp® phosphotriester linkage, the rate of formation of unmodified primer can be controlled to suit reaction needs.

Turbo Primers

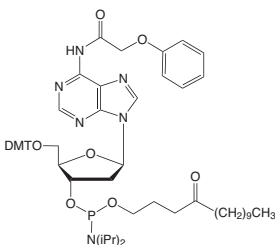
Fast cycling
 Multiplex PCR
 Improves amplicon yield
 Reduces mis-priming/primer dimer formation

Precision Primers

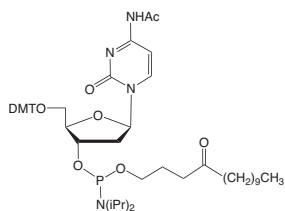
Standard cycling
 One-step reverse-transcription PCR
 Improved specificity and limit of detection
 Greatest reduction in mis-priming/primer dimer formation

Synthesis of CleanAmp® Primers requires the use of UltraMild Chemistry.

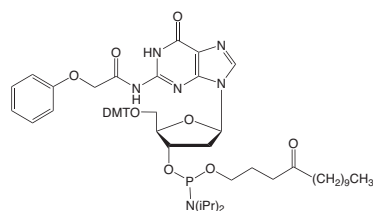
CleanAmp® Primers and monomers are available from TriLink BioTechnologies.



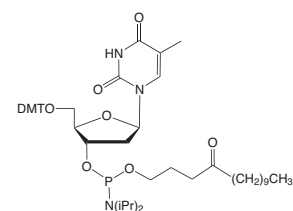
CleanAmp™-Pac-dA



CleanAmp™-Ac-dC



CleanAmp™-Pac-dG

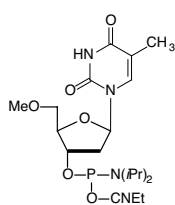


CleanAmp™-dT

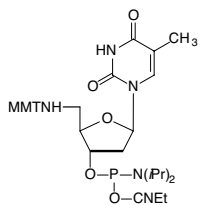
CHAIN TERMINATORS

In situations where ligation must be blocked at the 5' terminus, 5'-OMe-dT may be used. 5'-OMe modification of a strand of siRNA using 5'-OMe-T can control guide strand selection and targeting specificity.¹ 5'-Amino-dT terminates an oligonucleotide with a 5'-amino group which may be used for attaching a peptide or a PNA sequence. To avoid polymerase extension at the 3' terminus, 2',3'-dideoxynucleoside and 3'-deoxynucleoside CPGs have proved to be effective. 2',3'-Phosphoramidites are designed to be used with the 5'-phosphoramidites and supports. Since these phosphoramidites have no DMT group, they are not compatible with purification by the DMT-on technique. Ion exchange HPLC or PAGE should be used to purify these dideoxy terminated oligos to ensure that shorter sequences (containing 3'-OH) groups are removed. (3'-Termination can also be effected using a 3'-3' linkage formed using 5'-supports, or 3'-spacer C3 CPG.)

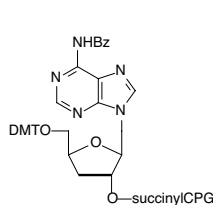
| Item | Catalog No. | Pack |
|--------------------------------|-------------------|-----------|
| 5'-OMe-dT-CE Phosphoramidite | 10-1031-90 | 100 µmole |
| | 10-1031-02 | 0.25g |
| 5'-Amino-dT-CE Phosphoramidite | 10-1932-90 | 100 µmole |
| | 10-1932-02 | 0.25g |
| 3'-dA-CPG | 20-2004-01 | 0.1g |
| | 1 µmole columns | Pack of 4 |
| | 0.2 µmole columns | Pack of 4 |
| 3'-dC-CPG | 20-2064-01 | 0.1g |
| | 1 µmole columns | Pack of 4 |
| | 0.2 µmole columns | Pack of 4 |
| 3'-dG-CPG | 20-2074-01 | 0.1g |
| | 1 µmole columns | Pack of 4 |
| | 0.2 µmole columns | Pack of 4 |
| 3'-dT-CPG | 20-2084-01 | 0.1g |
| | 1 µmole columns | Pack of 4 |
| | 0.2 µmole columns | Pack of 4 |



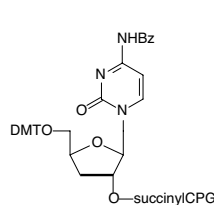
5'-OMe-Thymidine



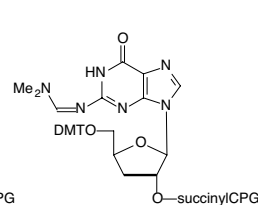
5'-Amino-dT



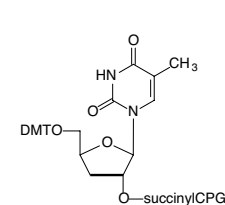
3'-dA-CPG



3'-dC-CPG



3'-dG-CPG



3'-dT-CPG

RELATED

| | |
|---------------------------|----|
| 5'-Phosphoramidites | 38 |
| 5'-Supports | 39 |
| 3'-Spacer C3 CPG | 92 |

REFERENCE

(1) P.Y. Chen, et al., *RNA*, 2008, **14**, 263-274..

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

CHAIN TERMINATORS (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

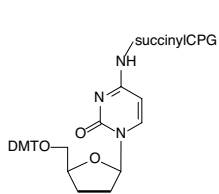
Columns

For Instrument type *Add*

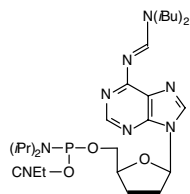
Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

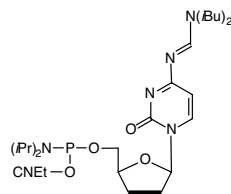
| Item | Catalog No. | Pack |
|------------------------------|-------------|----------------|
| 2',3'-ddC-CPG | 20-2017-01 | 0.1g |
| 1 μ mole columns | 20-2117-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2117-42 | Pack of 4 |
| 2',3'-ddA-CE Phosphoramidite | 10-7001-90 | 100 μ mole |
| | 10-7001-02 | 0.25g |
| 2',3'-ddC-CE Phosphoramidite | 10-7101-90 | 100 μ mole |
| | 10-7101-02 | 0.25g |
| 2',3'-ddG-CE Phosphoramidite | 10-7201-90 | 100 μ mole |
| | 10-7201-02 | 0.25g |
| 2',3'-ddT-CE Phosphoramidite | 10-7301-90 | 100 μ mole |
| | 10-7301-02 | 0.25g |



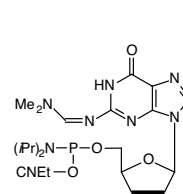
2',3'-ddC-CPG



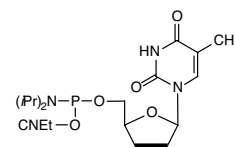
2',3'-ddA



2',3'-ddC



2',3'-ddG

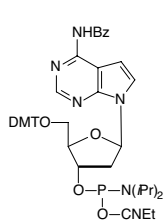


2',3'-ddT

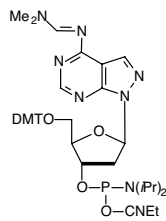
STRUCTURE/ACTIVITY RELATIONSHIP

The following products are used to investigate the effect on the activity of an oligonucleotide when key structural elements are changed. The 7-deaza purine monomers lack groups critical for hydrogen bonding. 7-Deaza-8-aza-A and 7-deaza-8-aza-G (PPG) monomers are isomers of A and G and have similar electron density. Their presence in oligos is slightly stabilizing relative to A and G. Unlike G, PPG does not lead to aggregation and G-rich oligos can be easily prepared and isolated. 5'-Fluorescein oligos with PPG at the 5'-terminus are much less quenched than the equivalent G oligos. As a purine analogue of Thymidine, 7-deaza-2'-deoxyXanthosine (7-deaza-dX) promises to have interesting effects on DNA structure of triplexes. 7-Deaza-dX also forms a non-standard base pair with a 2,4-diaminopyrimidine nucleoside analogue. Standard nucleobases have an unshared pair of electrons that project into the minor groove of duplex DNA. Enzymes that interact with DNA, polymerases, reverse transcriptases, restriction enzymes, etc., may use a hydrogen bond donating group to contact the hydrogen bond acceptor in the minor groove. 3-Deaza-2'-deoxyadenosine is very interesting in that it maintains the ability for regular Watson-Crick hydrogen bonding to T but is lacking the electron pair at the 3-position normally provided by N3.

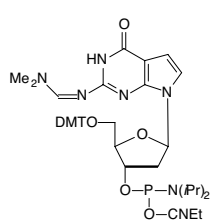
| Item | Catalog No. | Pack |
|---|-------------|----------------|
| 7-Deaza-dA-CE Phosphoramidite | 10-1001-95 | 50 μ mole |
| | 10-1001-90 | 100 μ mole |
| | 10-1001-02 | 0.25g |
| 7-Deaza-8-aza-dA-CE Phosphoramidite | 10-1083-95 | 50 μ mole |
| | 10-1083-90 | 100 μ mole |
| | 10-1083-02 | 0.25g |
| 7-Deaza-dG-CE Phosphoramidite | 10-1021-95 | 50 μ mole |
| | 10-1021-90 | 100 μ mole |
| | 10-1021-02 | 0.25g |
| 7-Deaza-8-aza-dG-CE Phosphoramidite (PPG) | 10-1073-95 | 50 μ mole |
| | 10-1073-90 | 100 μ mole |
| | 10-1073-02 | 0.25g |
| 7-Deaza-dX-CE Phosphoramidite | 10-1076-95 | 50 μ mole |
| | 10-1076-90 | 100 μ mole |
| | 10-1076-02 | 0.25g |
| 3-Deaza-dA-CE Phosphoramidite | 10-1088-95 | 50 μ mole |
| | 10-1088-90 | 100 μ mole |
| | 10-1088-02 | 0.25g |



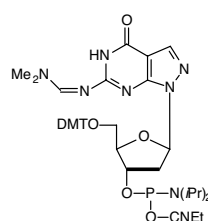
7-Deaza-2'-deoxyAdenosine



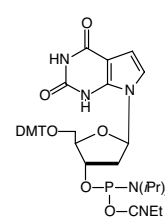
7-Deaza-8-Aza-2'-deoxyAdenosine



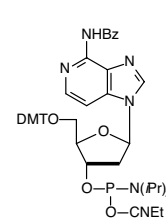
7-Deaza-2'-deoxyGuanosine



7-Deaza-8-Aza-2'-deoxyGuanosine



7-deaza-dX



3-Deaza-dA

STABILITY NOTES

7-Deaza-dG is unstable to iodine oxidation. Add a maximum of 2 times when using iodine oxidation or use 0.5M (10-camphorsulfonyl)-oxaziridine (CSO) in anhydrous acetonitrile and 3 min. oxidation time. (See Glen Report-Vol.9, No.1, 1996,page 8.)

INTELLECTUAL PROPERTY

The use of PPG is subject to proprietary rights of ELITechGroup and it is sold under license from ELITechGroup.

(1) I.V. Kutyavin, et al., *Nucleic Acids Res.*, 2002, **30**, 4952-4959.

STRUCTURE/ACTIVITY RELATIONSHIP (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

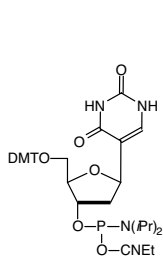
STABILITY NOTES

6-Thio-dG, 4-Thio-dT and 4-thio-dU are protected as the S-cyanoethyl ether which is stable during synthesis and readily removed by ammonium hydroxide. It is critical to add 50mM sodium hydrosulfide (NaSH) to the ammonium hydroxide used for deprotection. Especially if room temperature deprotection is carried out, this technique radically reduces the level of ammonolysis which would lead to undesired aminated bases. Moreover, it is also desirable to remove the cyanoethyl protecting group (1M DBU in acetonitrile, 2-5 h/RT) prior to the ammonium hydroxide cleavage and deprotection.

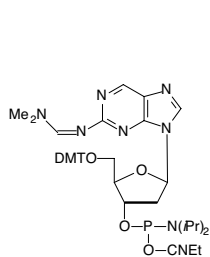
The C-nucleoside 2'-deoxypseudouridine, in contrast to dU, forms stable C:pseudoU-A triplets. 2-Aminopurine lacks groups critical for hydrogen bonding and is a mildly fluorescent base.

Demand for sulfur modified bases continues to expand for investigations of oligonucleotide structure, but primarily for cross-linking purposes. 6-Thio-dG, 4-Thio-dT and 4-thio-dU are very useful modifications for photo cross-linking and photoaffinity labeling experiments. Oligos containing 2-thio-dT are useful in examining protein-DNA interaction by acting as photosensitizing probes. The thiocarbonyl group in 2-thio-dT is especially interesting in that it is available to react with compounds associating with the minor groove of DNA. 2-Amino-A forms a very stable base pair with T containing three hydrogen bonds but the stability of the base pair with 2-thio-T is greatly diminished. Due to steric interactions between the 2-thio group of thymidine and the 2-amino group of 2-amino-A, the base pair contains only a single hydrogen bond. Oligos containing 2-amino-dA and 2-thio-dT exhibit high affinity for natural oligonucleotides but show little affinity for other similar oligos even of a complementary sequence.

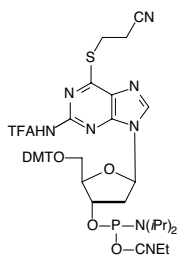
| Item | Catalog No. | Pack |
|------------------------------------|-------------|--------------|
| 2'-deoxypseudoU-CE Phosphoramidite | 10-1055-95 | 50 µmole |
| | 10-1055-90 | 100 µmole |
| | 10-1055-02 | 0.25g |
| 2-Aminopurine-CE Phosphoramidite | 10-1046-90 | 100 µmole |
| | 10-1046-02 | 0.25g |
| 6-Thio-dG-CE Phosphoramidite | 10-1072-95 | 50 µmole |
| | 10-1072-90 | 100 µmole |
| | 10-1072-02 | 0.25g |
| 4-Thio-dT-CE Phosphoramidite | 10-1034-95 | 50 µmole |
| | 10-1034-90 | 100 µmole |
| | 10-1034-02 | 0.25g |
| 4-Thio-dU-CE Phosphoramidite | 10-1052 | Discontinued |
| 2-Thio-dT-CE Phosphoramidite | 10-1036-95 | 50 µmole |
| | 10-1036-90 | 100 µmole |
| | 10-1036-02 | 0.25g |



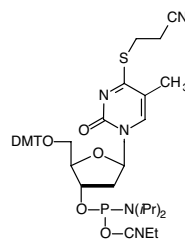
2'-dpseudoU



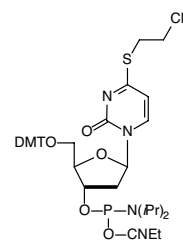
2-Aminopurine



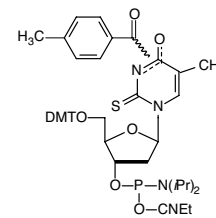
6-Thio-dG



4-Thio-dT



4-Thio-dU



2-Thio-dT

STRUCTURE/ACTIVITY RELATIONSHIP (CONT.)

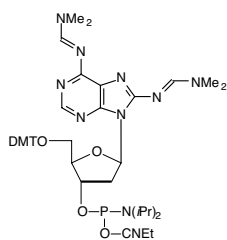
8-Amino-dA and 8-amino-dG are useful in triplex formation due to the presence of the additional amino groups.

2'-DeoxyXanthosine (dX) is a naturally occurring nucleoside that may be derived from oxidative deamination of 2'-deoxyGuanosine (dG). dX has a similar bonding pattern to thymidine and it may base pair with dA, with such purine-purine interactions causing duplex distortion. dX also featured in attempts to extend the genetic alphabet with a new base pair of dX and pyrimidine-2,4-diamine nucleoside. dX has also interested researchers in the field of DNA damage and repair since it is a product of nitric oxide-induced mutagenesis.

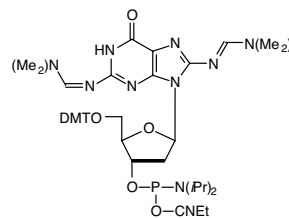
STABILITY NOTE

Synthetic oligonucleotides containing 8-amino-dG must be cleaved and deprotected with ammonium hydroxide containing 0.25M 2-mercaptoethanol to avoid oxidative degradation of 8-amino-dG sites.

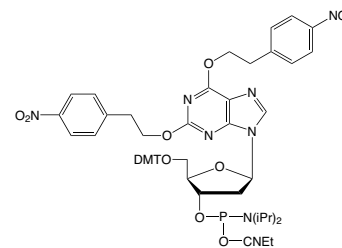
| Item | Catalog No. | Pack |
|-------------------------------|-------------|----------------|
| 8-Amino-dA-CE Phosphoramidite | 10-1086-95 | 50 μ mole |
| | 10-1086-90 | 100 μ mole |
| | 10-1086-02 | 0.25g |
| 8-Amino-dG-CE Phosphoramidite | 10-1079-95 | 50 μ mole |
| | 10-1079-90 | 100 μ mole |
| | 10-1079-02 | 0.25g |
| 2'-dX-CE Phosphoramidite | 10-1537-95 | 50 μ mole |
| | 10-1537-90 | 100 μ mole |
| | 10-1537-02 | 0.25g |



8-Amino-dA



8-Amino-dG



dX

HALOGENATED NUCLEOSIDES

Brominated and iodinated nucleosides are used in X-ray crystallography studies of oligonucleotide structure. They are also photolabile and are used for cross-linking studies to probe the structure of protein-DNA complexes. Antibodies exist to Br-dU and oligonucleotides containing Br-dU can be used as probes. 5-Fluoro-dU can be used as a non-photoreactive alternative to 5-Br-dU with similar electron density. 5-F-dU base pairs more strongly than T to both dA and the dG mismatch. It is also useful for probing DNA structure using 19F NMR spectroscopy.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

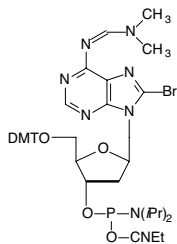
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

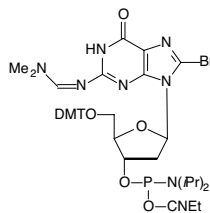
STABILITY NOTE

Oligonucleotides containing a bromo or iodo group are prepared conventionally with the exception that deprotection is carried out in ammonium hydroxide at room temperature for 24 hours. Under these conditions, degradation of the halogen group was less than 2%.

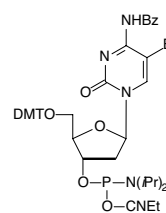
| Item | Catalog No. | Pack |
|----------------------------|--------------------------|-------------------------|
| 8-Br-dA-CE Phosphoramidite | 10-1007-90 10-1007-02 | 100 μ mole 0.25g |
| 8-Br-dG-CE Phosphoramidite | 10-1027-90 10-1027-02 | 100 μ mole 0.25g |
| 5-Br-dC-CE Phosphoramidite | 10-1080-90 10-1080-02 | 100 μ mole 0.25g |
| 5-I-dC-CE Phosphoramidite | 10-1081-90 10-1081-02 | 100 μ mole 0.25g |
| 5-Br-dU-CE Phosphoramidite | 10-1090-90 10-1090-02 | 100 μ mole 0.25g |
| 5-I-dU-CE Phosphoramidite | 10-1091-90 10-1091-02 | 100 μ mole 0.25g |
| 5-F-dU-CE Phosphoramidite | 10-1092-90 10-1092-02 | 100 μ mole 0.25g |
| 5-Br-dU-CPG | 20-2090-01 | 0.1g |
| 1 μ mole columns | 20-2090-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2090-42 | Pack of 4 |



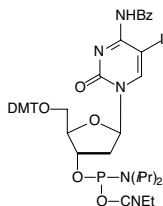
8-Bromo-2'-deoxyAdenosine



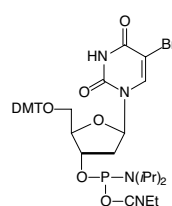
8-Bromo-2'-deoxyGuanosine



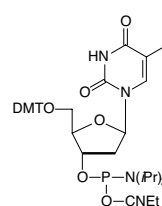
5-Bromo-2'-deoxyCytidine



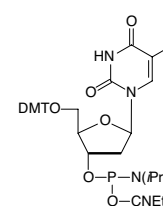
5-Iodo-2'-deoxyCytidine



5-Bromo-2'-deoxyUridine



5-Iodo-2'-deoxyUridine

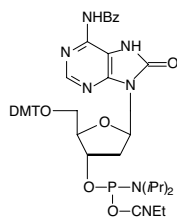


5-Fluoro-2'-deoxyUridine

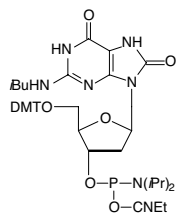
DNA DAMAGE/REPAIR

Cellular DNA is constantly being damaged by oxidation and alkylation, by free radicals, and by ultraviolet and ionizing radiation. The body has therefore evolved a number of repair enzyme systems to excise and repair these lesions. The 8-oxo purine monomers allow investigation of the structure and activity of oligonucleotides containing an 8-oxo mutation which is formed naturally when DNA is subjected to oxidative conditions or ionizing radiation. 5,6-Dihydro pyrimidines are naturally occurring compounds that are structural components of alanine transfer RNA. Dihydrouracil and the hydroxy pyrimidines are major base damage products formed by exposure of DNA to ionizing radiation.

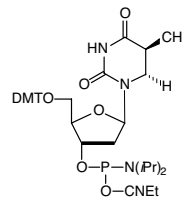
| Item | Catalog No. | Pack |
|---------------------------------------|-------------|----------------|
| 8-Oxo-dA-CE Phosphoramidite | 10-1008-90 | 100 μ mole |
| | 10-1008-02 | 0.25g |
| 8-Oxo-dG-CE Phosphoramidite | 10-1028-95 | 50 μ mole |
| | 10-1028-90 | 100 μ mole |
| | 10-1028-02 | 0.25g |
| 5,6-Dihydro-dT-CE Phosphoramidite | 10-1530 | Discontinued |
| 5,6-Dihydro-dU-CE Phosphoramidite | 10-1550-90 | 100 μ mole |
| | 10-1550-02 | 0.25g |
| 5-OH-dC-CE Phosphoramidite | 10-1063-90 | 100 μ mole |
| | 10-1063-02 | 0.25g |
| 5-OH-dU-CE Phosphoramidite | 10-1053-90 | 100 μ mole |
| | 10-1053-02 | 0.25g |
| 5-Hydroxymethyl-dU-CE Phosphoramidite | 10-1093-90 | 100 μ mole |
| | 10-1093-02 | 0.25g |



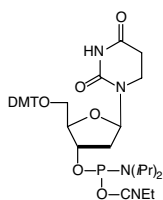
8-oxo-2'-deoxyAdenosine



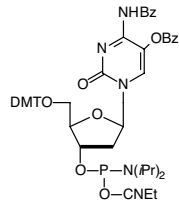
8-oxo-2'-deoxyGuanosine



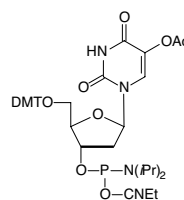
5,6-Dihydro-dT



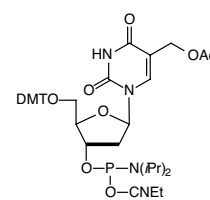
5,6-Dihydro-dU



5-OH-dC



5-OH-dU



5-Hydroxymethyl-dU

STABILITY NOTES

Synthetic oligonucleotides containing 8-oxo-dG must be cleaved and deprotected with ammonium hydroxide containing 0.25M 2-mercaptoethanol to avoid oxidative degradation of 8-oxo-dG sites.

Oligonucleotides synthesized using 5,6-dihydro-dU or 5,6-dihydro-dT and UltraMILD monomers can be cleaved using either concentrated ammonium hydroxide or 50 mM potassium carbonate in anhydrous methanol. Complete cleavage and deprotection can be accomplished at room temperature in 2-4 hours without damaging either the dihydro-dU or dihydro-dT bases.

RELATED

5-Hydroxymethyl-dC56
dX.....65

DNA DAMAGE/REPAIR (CONT.)

STABILITY NOTES

Synthetic oligonucleotides containing 8-amino-dG must be cleaved and deprotected with ammonium hydroxide containing 0.25M 2-mercaptoethanol to avoid oxidative degradation of 8-amino-dG sites.

Oligonucleotides synthesized using Thymidine Glycol and UltraMILD monomers can be cleaved using either concentrated ammonium hydroxide or 50 mM potassium carbonate in anhydrous methanol. Complete cleavage and deprotection can be accomplished at room temperature in 2-4 hours without damaging Thymidine Glycol base. The best method to remove the TBDMS groups was achieved using TEA.3HF at 40°C overnight.

REFERENCE

(1) K. Groebke, and C.J. Leumann, *Helv Chim Acta*, 1990, **73**, 608-617.

RELATED

dSpacer.....92
Pyrrolidine.....69

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

For Instrument type *Add*

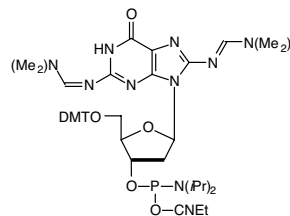
Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

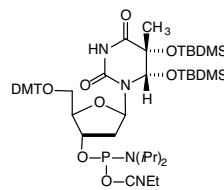
8-Amino-G is formed along with 8-oxo-G as the major mutagenic lesions formed in DNA damage caused by 2-nitropropane. 2-Nitropropane is an industrial solvent and a component of paints, dyes and varnishes, and is also present in cigarette smoke. Thymine glycol (5,6-dihydroxy-5,6-dihydrothymine) is formed when thymine is subjected to oxidative stress, including ionizing radiation. Oxidation of the 5,6 double bond of Thymidine generates two chiral centers at C5 and C6. The cis-5R,6S form is generated as the predominant product along with the other diastereomer, the cis-5S,6R form. The presence of thymidine glycol in DNA has significant biological consequences and many organisms possess specific repair enzymes for the excision of this lesion.

Hydrolysis of nucleoside residues in DNA occurs to generate abasic sites. Most commonly, dA sites are hydrolyzed causing depurination and leading to abasic residues. For researchers trying to determine if their source of depurination in chemical synthesis of DNA is reagent, fluidics or protocol-based, we offer a depurination-resistant dA monomer. A new chemical method allows the generation of abasic sites in double and single stranded oligonucleotides using very mild specific conditions and with very low probability of side reactions. Abasic II Phosphoramidite¹ has the advantage of simplicity in that the silyl group is removed post-synthesis using aqueous acetic acid. dSpacer has also been used successfully as a mimic of the highly base-labile abasic site.

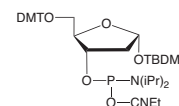
| Item | Catalog No. | Pack |
|---|-------------|-----------|
| 8-Amino-dG-CE Phosphoramidite | 10-1079-95 | 50 µmole |
| | 10-1079-90 | 100 µmole |
| | 10-1079-02 | 0.25g |
| Thymidine Glycol CE Phosphoramidite | 10-1096-95 | 50 µmole |
| | 10-1096-90 | 100 µmole |
| | 10-1096-02 | 0.25g |
| Abasic II Phosphoramidite (dR Precursor) | 10-1927-95 | 50 µmole |
| | 10-1927-90 | 100 µmole |
| | 10-1927-02 | 0.25g |



8-Amino-dG



Thymidine Glycol



Abasic II Phosphoramidite

DNA DAMAGE/REPAIR (CONT.)

One of the major sources of DNA damage in all organisms is the UV component of sunlight. The predominant reaction induced by UV light on DNA is dimerization of adjacent pyrimidine bases leading to cyclobutane dimers (CPDs). The dimers formed in the most significant quantity are the *cis-syn* cyclobutane dimer of two thymine bases. Although formed routinely, these dimer products are efficiently excised and repaired enzymatically by nucleotide excision repair (NER) or the dimerization is reversed by photolase enzymes. A further mode of oxidative damage is radiation-induced damage of DNA, which has been shown to lead to bridged cyclonucleosides. The purines, cyclo-dA and cyclo-dG, are predominantly formed, although the cyclo pyrimidines have also been detected. Cyclo-dA is doubly intriguing since it contains both damaged base and damaged sugar residues and, as such, should have a considerable biological impact. In a manner analogous to thymine dimer, cyclo purines cause significant distortion of the regular DNA helix and these lesions are repaired not by base excision repair (BER) but by NER.

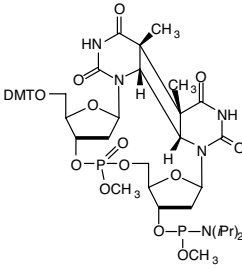
INSTRUMENT TYPES

For these very expensive phosphoramidites, an ABI septum vial is the standard vial. Add E to the catalog no. for an Expedite vial or V to the catalog no. for an Expedite V vial.

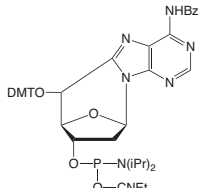
| Item | Catalog No. | Pack |
|--|-------------|----------------|
| <i>Cis-syn</i> Thymine Dimer Phosphoramidite | 11-1330-95 | 50 μ mole |
| | 11-1330-90 | 100 μ mole |
| | 11-1330-02 | 0.25g |
| 5',8-Cyclo-dA CE Phosphoramidite | 10-1098 | Discontinued |
| 5',8-Cyclo-dG CE Phosphoramidite | 10-1598 | Discontinued |

Base excision repair (BER) is one of the most studied repair mechanisms. In this pathway, DNA glycosylases recognize the damaged bases and catalyze their excision through hydrolysis of the N-glycosidic bond. Attempts to understand the structural basis for DNA damage recognition by DNA glycosylases have been hampered by the short-lived association of these enzymes with their DNA substrates. To overcome this problem, the Verdine group at Harvard synthesized a pyrrolidine analog that mimics the charged transition state of the enzyme-substrate complex. When incorporated into double-stranded DNA, they found the pyrrolidine analog (PYR), introduced as the Pyrrolidine-CE Phosphoramidite, forms an extremely stable complex with the DNA glycosylase AlkA, exhibiting a dissociation constant in the pM range and potently inhibited the reaction catalyzed by the enzyme.

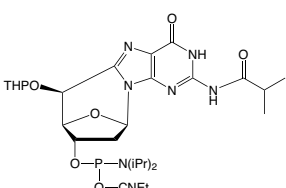
| Item | Catalog No. | Pack |
|--------------------------------------|-------------|--------------|
| Pyrrolidine-CE Phosphoramidite (PYR) | 10-1915 | Discontinued |



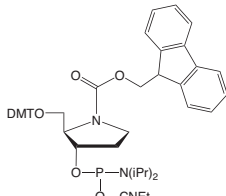
Cis-syn Thymine Dimer



5',8-Cyclo-dA



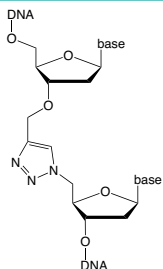
5',8-Cyclo-dG



Pyrrolidine

CLICK DNA AND RNA LIGATION

BIOCOMPATIBLE TRIAZOLE LINKAGE



RELATED

5'-I-dT in Click Chemistry98
Click Chemistry96

REFERENCES - CLICK LIGATION

- (1) A.H. El-Sagheer, A.P. Sanzone, R. Gao, A. Tavassoli, and T. Brown, *Proc Natl Acad Sci U S A*, 2011, **108**, 11338-43.
- (2) A.H. el-Sagheer, and T. Brown, *Chem Commun (Camb)*, 2011, **47**, 12057-8.
- (3) A.P. Sanzone, A.H. El-Sagheer, T. Brown, and A. Tavassoli, *Nucleic Acids Res*, 2012.
- (4) A. Dallmann, et al., *Chemistry*, 2011, **17**, 14714-7.
- (5) A.H. El-Sagheer, and T. Brown, *Proc Natl Acad Sci U S A*, 2010, **107**, 15329-34.

REFERENCES - MicroRNA Labeling

- (1) H. Vogel, and C. Richert, *ChemBioChem*, 2012, **13**, 1474-82.
- (2) R. Eisenhuth, and C. Richert, *Journal of Organic Chemistry*, 2008, **74**, 26-37.
- (3) E. Kervio, A. Hochgesand, U.E. Steiner, and C. Richert, *Proc Natl Acad Sci U S A*, 2010, **107**, 12074-9.

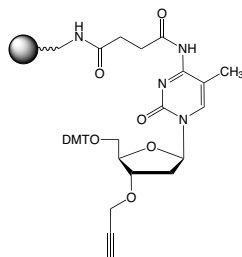
Ligation of an oligo containing a 5'-azide with an oligo containing a 3'-propargyl group using Click Chemistry leads to a triazole linkage that has been shown to have in vivo biocompatibility. This technique has been used to synthesize DNA constructs up to 300 bases in length. When the resultant triazole linkage was placed in a PCR template, various polymerases were able to copy the sequence correctly. The linkage has also been shown to be compatible with transcription and rolling circle amplification, as well as gene expression in *E. coli*. In the RNA world, a hammerhead ribozyme containing the triazole linkage at the substrate cleavage site has been shown to retain its activity. A large variety of applications is envisaged for this biocompatible chemical ligation. Support for this technology is offered with the help of Tom Brown's group at the University of Southampton.

| Item | Catalog No. | Pack |
|---------------------------------|-------------|-----------|
| 3'-Propargyl-5-Me-dC CPG | 20-2982-01 | 0.1g |
| | 20-2982-10 | 1.0g |
| 1 μ mole columns | 20-2982-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2982-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-2982-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2982-14 | Pack of 1 |

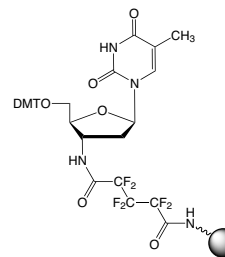
5'-LABELING OF MicroRNAs

Several methods have been developed for the detection of miRNAs, however, few allow the simultaneous detection of multiple miRNAs. To overcome this analytical deficiency, the Richert group at the University of Stuttgart has recently developed an ingenious method to selectively detect miRNAs on microarrays without interference from endogenous pre-mRNAs, mRNAs and other RNA species. In this method, a short oligonucleotide containing 3'-amino-dT and a 5' reporter molecule is chemically ligated to the microRNA in a one-step procedure by in situ activation of the microRNA. This is specifically achieved by taking advantage of the fact that miRNAs, unlike other RNAs, are 5'-phosphorylated. The reaction is template-directed (and thus sequence specific) and can be performed together with enzymatic 3'-extension/labeling, either in solution or on a support. The short DNA labeling strand may feature one of a variety of different labels, such as a biotin group or a fluorophore.

| Item | Catalog No. | Pack |
|---------------------------------|-------------|-----------|
| 3'-Amino-dT CPG | 20-2981-01 | 0.1g |
| | 20-2981-10 | 1.0g |
| 1 μ mole columns | 20-2981-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2981-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-2981-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2981-14 | Pack of 1 |



3'-Propargyl-5-Me-dC CPG

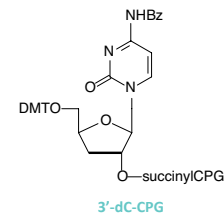
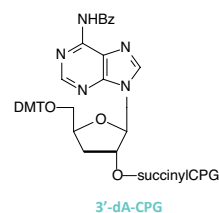
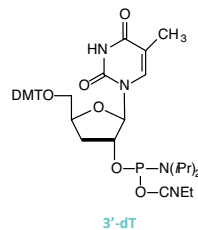
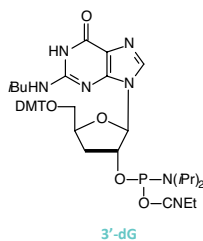
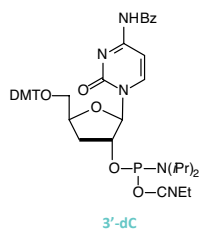
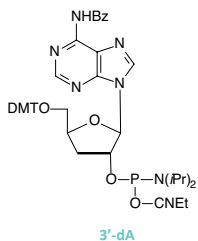


3'-Amino-dT CPG

2'-5' LINKED OLIGONUCLEOTIDES

Cellular DNA and RNA are made up of ribo- and 2'-deoxyribonucleic acids linked together via 3'-5' phosphodiester linkages and by far comprise the bulk of polynucleic acids found in cells. Much less common are oligonucleotides which have 2'-5' linkages. However, a unique feature of 2'-5' linked oligonucleotides is their ability to bind selectively to complementary RNA. These features suggest a number of interesting uses for 2'-5' linked oligos such as their use as RNA specific probes or in antisense oligos. Recently, oligos have been synthesized using 3'-deoxy-2'-phosphoramidites and 2'-deoxy-3'-phosphoramidites to produce chimeras with 2'-5' linked ends and 3'-5' linked central regions. It was found that 2'-5' phosphorothioate oligos: 1) bind selectively to complementary RNA with the same affinity as phosphodiester oligos; 2) exhibit much less nonspecific binding to cellular proteins; 3) do not activate RNase H. A 3'-deoxynucleoside at the 3'-terminus of an otherwise normal oligonucleotide effectively blocks polymerase extension.

| Item | Catalog No. | Pack |
|--------------------------|------------------------|----------------|
| 3'-dA-CE Phosphoramidite | 10-1004-95 | 50 μ mole |
| | 10-1004-90 | 100 μ mole |
| | 10-1004-02 | 0.25g |
| 3'-dC-CE Phosphoramidite | 10-1064-95 | 50 μ mole |
| | 10-1064-90 | 100 μ mole |
| | 10-1064-02 | 0.25g |
| 3'-dG-CE Phosphoramidite | 10-1074-95 | 50 μ mole |
| | 10-1074-90 | 100 μ mole |
| | 10-1074-02 | 0.25g |
| 3'-dT-CE Phosphoramidite | 10-1084-95 | 50 μ mole |
| | 10-1084-90 | 100 μ mole |
| | 10-1084-02 | 0.25g |
| 3'-dA-CPG | 20-2004-01 | 0.1g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 3'-dC-CPG | 20-2064-01 | 0.1g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |



OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

RELATED

3'-deoxynucleoside CPG.....39

2'-5' LINKED OLIGONUCLEOTIDES (CONT.)

RELATED

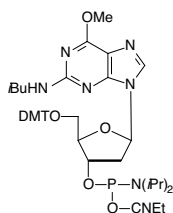
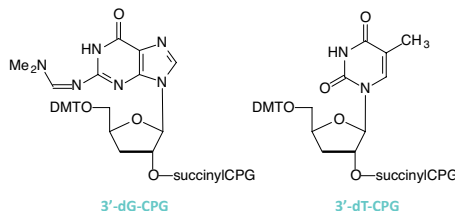
N6-Me-dA.....53

| Item | Catalog No. | Pack |
|-------------------|-------------|-----------|
| 3'-dG-CPG | 20-2074-01 | 0.1g |
| 1 μmole columns | 20-2174-41 | Pack of 4 |
| 0.2 μmole columns | 20-2174-42 | Pack of 4 |
| 3'-dT-CPG | 20-2084-01 | 0.1g |
| 1 μmole columns | 20-2184-41 | Pack of 4 |
| 0.2 μmole columns | 20-2184-42 | Pack of 4 |

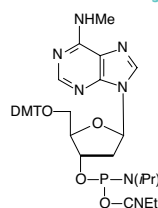
MUTAGENESIS

Cellular polynucleotides are alkylated by endogenous components, such as S-adenosylmethionine, or after reacting with two general classes of environmental and laboratory chemicals. SN1 chemical agents include alkylnitrosourea and N-alkyl-N-nitro-N-nitrosoguanidine that react with the N7 position of guanine, N3 of adenine, O6 of guanine, O2 or O4 of pyrimidines, and the non-phosphodiester oxygen atoms of the phosphate backbone. In contrast, SN2 chemical agents such as methyl methanesulfonate and dimethyl sulfate react primarily with the N1 position of adenine (1-Methyl-2'-deoxyadenosine) and N3 of cytosine. To avoid chain branching during synthesis when using DCI as activator, N6-Me-dA is offered with acetyl protection.

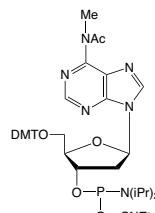
| Item | Catalog No. | Pack |
|-----------------------------------|--|--------------------------------|
| O6-Me-dG-CE Phosphoramidite | 10-1070-90 10-1070-02 | 100 μmole 0.25g |
| N6-Me-dA-CE Phosphoramidite | 10-1003-90 10-1003-02 | 100 μmole 0.25g |
| N6-Ac-N6-Me-dA-CE Phosphoramidite | 10-1503-90 10-1503-02 | 100 μmole 0.25g |
| O4-Me-dT-CE Phosphoramidite | 10-1032 | Discontinued |
| 1-Me-dA-CE Phosphoramidite | 10-1501-95 10-1501-90 10-1501-02 | 50 μmole 100 μmole 0.25g |



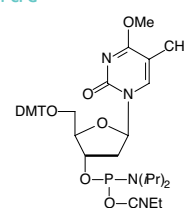
O6-Me-2'-deoxyGuanosine



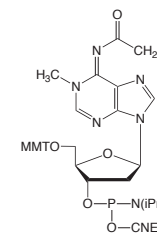
N6-Methyl-2'-deoxyAdenosine



N6-Ac-N6-Me-dA



O4-Me-Thymidine

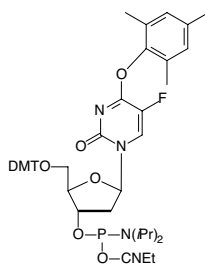


1-Methyl-2'-deoxyAdenosine

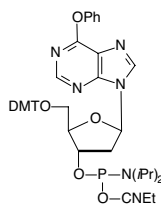
IN SITU SYNTHESIS OF DNA ANALOGS

The convertible nucleoside strategy is one of the most versatile methods for producing modifications in bases to examine their effects on DNA structure and activity. In some cases, with versatility comes difficulty in that the convertible base is modified after oligonucleotide synthesis. The chemistry is sometimes complex and base composition analysis of the final oligonucleotide is required to verify structure. The convertible dU monomer can be used to introduce a variety of modifications at the convertible position, including N, O and S modifications. Convertible F-dC is by far the simplest approach to the preparation of oligonucleotides containing F-dC - normal ammonium hydroxide treatment effects the conversion to F-dC. Convertible dA has been used to prepare oligonucleotides containing multiple points for attachment to solid supports. In this way, high capacity affinity supports for the purification of DNA binding proteins have been prepared. 2-F-dI is a convertible nucleoside for the preparation of 2'-dG derivatives following the displacement of the 2-fluorine by primary amines.

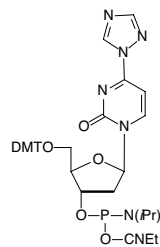
| Item | Catalog No. | Pack |
|--|-------------|----------------|
| TMP-F-dU-CE Phosphoramidite (Convertible F-dC) | 10-1016-90 | 100 μ mole |
| | 10-1016-02 | 0.25g |
| O6-Phenyl-dI-CE Phosphoramidite (Convertible dA) | 10-1042-90 | 100 μ mole |
| | 10-1042-02 | 0.25g |
| O4-Triazolyl-dU-CE Phosphoramidite (Convertible dU) | 10-1051-90 | 100 μ mole |
| | 10-1051-02 | 0.25g |
| 2-F-dI-CE Phosphoramidite (Convertible dG) | 10-1082-95 | 50 μ mole |
| | 10-1082-90 | 100 μ mole |
| | 10-1082-02 | 0.25g |



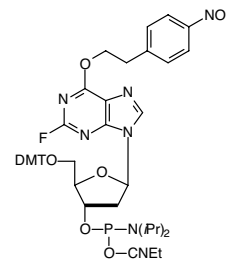
TMP-F-dU



O6-Phenyl-dI



O4-Triaz.-dU



2-F-dI

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

ABBREVIATION

TMP = 2,4,6-trimethylphenyl

PROBING DNA STRUCTURE WITH FLUORESCENT NUCLEOSIDES

RELATED

| | |
|---------------------------|-----|
| 2-Aminopurine | 64 |
| AP-dC (G-Clamp) | 52 |
| UltraMild Chemistry | 27 |
| Pyrrolo-C | 140 |
| Pyrrolo-CTP | 144 |

INTELLECTUAL PROPERTY

Pyrrolo-dC is a joint development project of Berry & Associates, Inc. and Glen Research. Pyrrolo-dC is covered by US Patent No.: 7,144,995.

SPECTRAL PROPERTIES

The spectral properties of pyrrolo-dC, coupled with its unique base-pairing ability, make this fluorescent analog extremely valuable in probing DNA structure. When the pyrrolo-dC is base-paired, its fluorescence is significantly quenched through what is most likely base stacking or dG interactions. The quantum yield of fluorescence for pyrrolo-dC is quite sensitive to its hybridization state, making it ideally suited for probing the dynamic structure of DNA.

| | QY | λ | ϵ |
|-----------------|------|----------------|--------------|
| | | | (L/mol.cm) |
| single-stranded | 0.07 | 260nm 347nm | 4000 3700 |
| double-stranded | 0.02 | | |

(QY determined relative to quinine sulfate in 0.5M H₂SO₄)

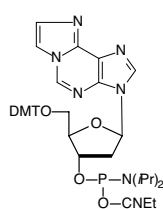
REFERENCES

1. D.A. Berry, et al., *Tetrahedron Lett*, 2004, **45**, 2457-2461.
2. The Glen Report, 2007, **19**, 8-9.
3. P. Sandin, et al., *Nucleic Acids Res.*, 2008, **36**, 157-167.
4. P. Sandin, et al., *Nucleic Acids Res.*, 2005, **33**, 5019-5025.
5. K.C. Engman, et al., *Nucleic Acids Res.*, 2004, **32**, 5087-5095.

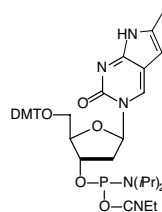
Etheno-dA is a fluorescent nucleoside which is especially useful in observing the transition between DNA structural types. It is quite base labile and should be deprotected with ammonium hydroxide at room temperature for 24 hours. Alternatively, UltraMild chemistry can be used. 2-Aminopurine and AP-dC (G-Clamp) are also useful fluorescent nucleosides.

Pyrrolo-dC is a fluorescent deoxycytidine analog that is an ideal probe of DNA structure and dynamics.^{1,2} It base-pairs as a normal dC nucleotide. An oligo fully substituted with pyrrolo-dC has the same T_m as the control dC oligo with the same specificity for dG. Its small size does not perturb the structure of the DNA helix and it is well tolerated by a number of DNA and RNA polymerases. It is highly fluorescent and its excitation and emission are well to the red of most fluorescent nucleotide analogs, which eliminates or reduces background fluorescence from proteins. Pyrrolo-dCTP has potential uses in biological assay development.

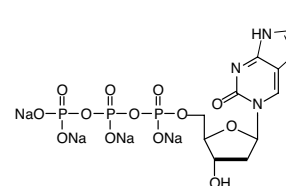
| Item | Catalog No. | Pack |
|-------------------------------|--|--|
| Etheno-dA-CE Phosphoramidite | 10-1006-90 10-1006-02 | 100 μ mole 0.25g |
| Pyrrolo-dC-CE Phosphoramidite | 10-1017-95 10-1017-90 10-1017-02 | 50 μ mole 100 μ mole 0.25g |
| Pyrrolo-dCTP (10 mM) | 81-1017 | Discontinued |



Etheno-2'-deoxyAdenosine



Pyrrolo-dC



Pyrrolo-dCTP

PROBING DNA STRUCTURE WITH FLUORESCENT NUCLEOSIDES (CONT.)

By attaching pyrene or perylene to the 5 position of deoxyuridine through a triple bond, the fluorophore is electronically coupled to the deoxyuridine base. This electronic coupling of the base and the fluorophore makes the fluorescence sensitive to the base pairing of the dU portion of the molecule, allowing the discrimination between perfect and one base mismatched targets.

| Item | Catalog No. | Pack |
|--------------------------------|-------------|----------------|
| Pyrene-dU-CE Phosphoramidite | 10-1590-95 | 50 μ mole |
| | 10-1590-90 | 100 μ mole |
| | 10-1590-02 | 0.25g |
| Perylene-dU-CE Phosphoramidite | 10-1591-95 | 50 μ mole |
| | 10-1591-90 | 100 μ mole |
| | 10-1591-02 | 0.25g |

SPECTRAL PROPERTIES

| | Absorbance Maximum | Emission Maximum |
|-------------|--------------------|------------------|
| Pyrene-dU | 402nm | 472nm |
| Perylene-dU | 473nm | 490nm |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

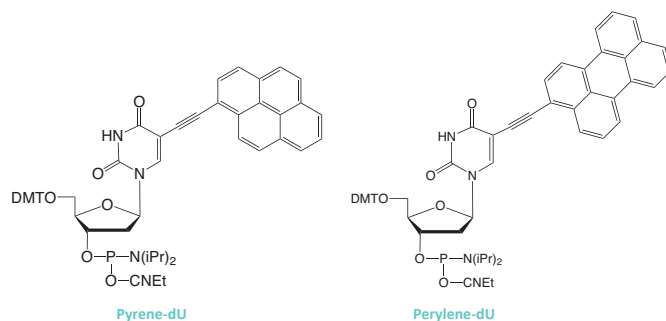
| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)



PROBING DNA STRUCTURE WITH FLUORESCENT NUCLEOSIDES (CONT.)

RELATED

Ribo-tCo..... 144

SPECTRAL PROPERTIES

Absorption and emission data for tC and tC^o are collected below:

| tC | QY | λ | ε (L/mol.cm) |
|-----------------|------|-------|-----------------|
| single-stranded | 0.21 | 385nm | 4000 |
| double-stranded | 0.19 | | |

| tC ^o | QY | λ | ε (L/mol.cm) |
|-----------------|------|-------|-----------------|
| single-stranded | 0.30 | 360nm | 9000 |
| double-stranded | 0.21 | | |

(QY determined relative to quinine sulfate in 0.5M H₂SO₄)

INTELLECTUAL PROPERTY

These products are offered in collaboration with ModyBase HB.

The tricyclic fluorescent nucleoside analogues, 1,3-diaza-2-oxophenothiazine, tC, and 1,3-diaza-2-oxophenoxazine, tC^o, are deoxycytidine analogs that have been shown to base pair faithfully with dG with virtually no disruption of the normal duplex structure.³⁻⁵ This means that the stability of the DNA duplex is not compromised as compared to the control regardless of DNA sequence. The fluorescence quantum yield of tC is essentially unchanged between single stranded and double stranded DNA - 0.21 for single stranded DNA and 0.19 for duplex DNA. Also, the fluorescence characteristics of tC are not sensitive to neighboring base combinations. tC^o has been shown to be the brightest fluorescent nucleoside analogue in duplex context reported so far and even retains the majority of its fluorescence when surrounded by guanine residues. Indeed, tC^o has been reported to be 25-50 times brighter than 2-aminopurine.

The base analogue tC_{nitro} is a FRET-acceptor together with tC^o (or tC) as the donor molecule. This constitutes the first ever description of a nucleobase FRET-pair. This novel FRET-pair provides a unique tool for investigations of nucleic acid containing systems. tC_{nitro} is virtually non-fluorescent under normal conditions.

| Item | Catalog No. | Pack |
|---|-------------|-----------|
| tC-CE Phosphoramidite | 10-1516-95 | 50 μmole |
| | 10-1516-90 | 100 μmole |
| | 10-1516-02 | 0.25g |
| tC ^o -CE Phosphoramidite | 10-1517-95 | 50 μmole |
| | 10-1517-90 | 100 μmole |
| | 10-1517-02 | 0.25g |
| tC _{nitro} -CE Phosphoramidite | 10-1518-95 | 50 μmole |
| | 10-1518-90 | 100 μmole |
| | 10-1518-02 | 0.25g |

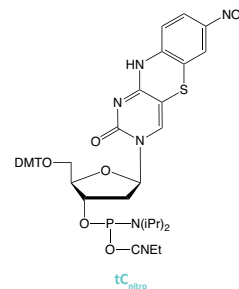
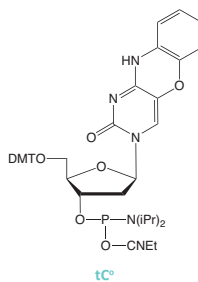
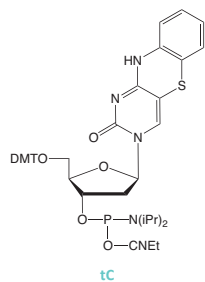
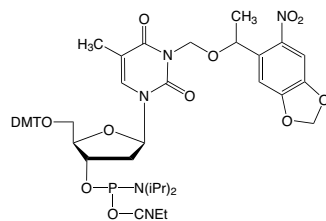


PHOTO-REGULATION OF DNA FUNCTION

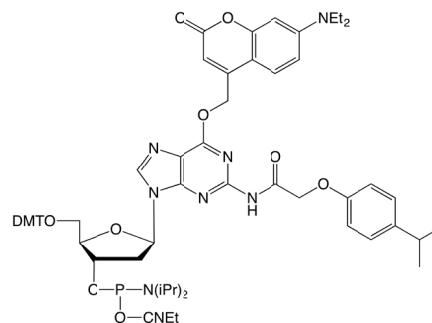
Photocaged oligonucleotides allow for the spatial temporal control of biological processes. In their caged form, the oligonucleotides are unable to participate in base pairing. It is only after exposure to non-invasive light that the native oligonucleotide is released. DEACM-dG is a convenient way to introduce a photocage at specific positions, and the DEACM is an effective photocleavable group.

Glen Research's interest lies in the preparation of caged oligonucleotides whose function is restored after uncaging by UV light at a wavelength that causes no DNA damage. The Deiters group at North Carolina State University has described NPOM-Caged-dT, where the nucleobase is caged with the photolabile group, 6-nitropiperonyloxymethyl (NPOM), which can be removed using UV light at 365 nm. Oligonucleotides containing NPOM-Caged-dT every five or six bases do not hybridize to their complementary strand. Photo-uncaging of the caged oligonucleotide is then easily carried out with UV light at 365 nm for seconds to minutes to restore the activity of the oligonucleotide.

| Item | Catalog No. | Pack |
|-----------------------------------|-------------|----------------|
| DEACM-Caged-dG-CE Phosphoramidite | 10-1533-95 | 50 μ mole |
| | 10-1533-90 | 100 μ mole |
| | 10-1533-02 | 0.25g |
| NPOM-Caged-dT-CE Phosphoramidite | 10-1534-95 | 50 μ mole |
| | 10-1534-90 | 100 μ mole |
| | 10-1534-02 | 0.25g |



NPOM-Caged-dT



DEACM-Caged-dG

REFERENCES

- (1) G. Sheikhnjad, et al., *J Mol Biol*, 1999, **285**, 2021-2034.
- (2) V.E. Marquez, et al., *Antisense Nucleic Acid Drug D*, 1999, **9**, 415-421.

RELATED

| | |
|-------------------------------|----|
| Convertible F-dC..... | 39 |
| 5-Fluoro-2'-deoxyUridine..... | 66 |
| Pyrrolidine..... | 69 |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

INHIBITION OF DNA METHYLTRANSFERASES

RELATED

| | |
|--------------------------------------|------|
| 7-Deaza-8-Aza-2'-deoxyGuanosine..... | 63 |
| 8-oxo-2'-deoxyGuanosine..... | 67 |
| 7-Deaza-2'-deoxyGuanosine..... | 63 |
| Abasic II Phosphoramidite..... | 68 |
| dSpacer..... | 92 |
| 8-Amino-dG..... | 68 |
| 8-Amino-dA..... | 65 |
| 6-Thio-dG..... | 64 |
| 2'-dpseudoU..... | 6464 |
| 5-Hydroxymethyl-dC..... | 56 |

Zebularine (pyrimidin-2-one ribonucleoside) is a cytidine analogue that acts as a DNA demethylase inhibitor, as well as a cytidine deaminase inhibitor. This structure is very active biologically and Zebularine is now used as a potent anti-cancer drug. A 2'-deoxynucleoside analogue of Zebularine, 5-methyl-pyrimidin-2-one, 2'-deoxynucleoside, has been used to probe the initiation of the cellular DNA repair process by making use of its mildly fluorescent properties. This combination of biological activity and fluorescence properties would make 5-Me-2'-deoxyZebularine a strong addition to our array of nucleoside analogues.

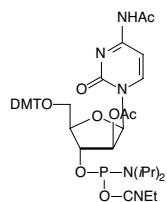
Cytosine-5-methyltransferases are found in everything from archaeobacteria to mammals and when the regulation of cytosine-5-methyltransferases goes awry, cancer can result. The mechanism of action for this family of enzymes involves attack of a cysteine thiol group on the C6 position of cytosine, leading to a transient dihydrocytosine intermediate, which then facilitates the nucleophilic attack by C5 on the activated methyl group of the S-adenosyl-L-methionine cofactor. As with many enzymes, the intermediate can be trapped using a suicide substrate and 5-fluoro-cytosine has been used extensively in this role. An alternate strategy is to use a transition-state mimic that binds to the active site with high affinity. An excellent candidate was found in 5-aza-5,6-dihydrocytosine. Despite not being covalently bound to the enzyme, it was found^{1,2} to be a more potent inhibitor of cytosine-5-methyltransferases than 5-fluoro-cytosine. 5-Aza-5,6-dihydro-dC is compatible with standard oligonucleotide synthesis and deprotection conditions and is an excellent tool for use in methyltransferase research.

| Item | Catalog No. | Pack |
|--|-------------|-----------|
| 5-Me-2'-deoxyZebularine-CE Phosphoramidite | 10-1061-95 | 50 μmole |
| | 10-1061-90 | 100 μmole |
| | 10-1061-02 | 0.25g |
| 5-Aza-5,6-dihydro-dC-CE Phosphoramidite | 10-1511-95 | 50 μmole |
| | 10-1511-90 | 100 μmole |
| | 10-1511-02 | 0.25g |

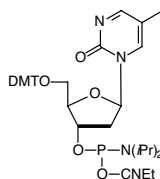
LARGE SCALE SYNTHESIS

The most common side reaction during deprotection of oligonucleotides on a large scale is the alkylation of dT residues by acrylonitrile, formed by β-elimination of the cyanoethyl phosphate protecting groups, to generate N3-cyanoethyl-dT.

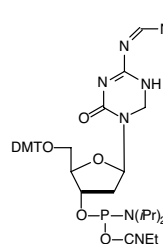
| Item | Catalog No. | Pack |
|------------------|-------------|-----------|
| N3-Cyanoethyl-dT | 10-1531-90 | 100 μmole |
| | 10-1531-02 | 0.25g |



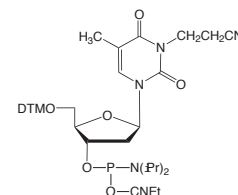
Ara-C



5-Me-2'-deoxyZebularine



5-Aza-5,6-Dihydro-dC



N3-Cyanoethyl-dT

NON-CANONICAL STRUCTURES

DNA and RNA structures are defined by Watson-Crick rules of hybridization. However, a variety of DNA and RNA structures have been defined which do not rely on simple A-T/U and G-C binding. Since these structures disobey the Watson-Crick canon, they are described as non-canonical. Non-canonical DNA and RNA segments are formed as a result of secondary structures. These include G-quadruplexes, triplex forming oligos, hairpins, cruciforms, and i-Motif structures.

G-QUADRUPLEX

Oligonucleotide structural analysis has demonstrated that DNA and RNA nucleic acid sequences containing G-tracts separated by other bases spontaneously fold into G-quadruplex structures. G-quadruplexes are formed when four adjacent guanine residues stack in a cyclic Hoogsteen hydrogen-bonding arrangement leading to four-stranded helical structures. The study of G-quadruplexes in basic genetic processes is an active area of research in telomerase activity, gene regulation, and functional genomics. Guanine analogues that have different hydrogen bonding characteristics - 7-deaza-8-aza-dG and 7-deaza-dG - have proved useful in analyzing G-quadruplex structures. Similarly, common DNA lesions - 8-oxo-dG and abasic sites - have been used to investigate their effect on G-quadruplex structure and activity.

TRIPLEX-FORMING OLIGONUCLEOTIDES

Triplex-forming oligonucleotides (TFO) bind in the major groove of duplex DNA in a sequence-specific manner through the formation of non Watson-Crick (Hoogsteen) hydrogen bonds. The formation of a triplex along the major groove competes with the binding of transcription factors and other proteins that are necessary for transcription, thereby inhibiting the expression of particular genes. A variety of nucleoside analogues have been used in TFO - 8-amino-dG, 8-amino-dA, 6-thio-dG and deoxyseoudouridine.

i-MOTIF DNA STRUCTURES

Intercalated Motif (i-Motif) DNA structures may be formed in regions rich in 2'-deoxyCytidine. Especially at acidic pH, these structures could be described as C-Quadruplexes with two parallel stranded sequences also held together in an antiparallel orientation by cytosine-cytosine base pairs. Since these structures are stable at acidic pH, they can act as nanoswitches by change in pH. As they were not considered to be stable at physiological pH, they were not initially considered to be relevant to biological systems. However, the stability of the cytosine-cytosine base pair is enhanced by intercalating ligands and so a variety of i-Motif structures are now considered to be biologically significant. Since i-Motif structures have now been observed forming and dissolving in living cells, these structures are now the subject of active investigation of the meaning of their activity in human cells. Research is also being directed to the effect of common DNA lesions, like depurinated sites, 8-oxo-dG and 5-hydroxymethyl-dC, on these transient structures.

APTAMER DEVELOPMENT

Aptamers, generated through repetitive selection using SELEX or an equivalent *in vivo* procedure, are chosen for their ability to bind desired target molecules, which are frequently small molecules useful in therapeutics. In some ways, they may be described as chemically engineered versions of antibodies. Of course, nucleic acid aptamers have advantages over antibodies in that they can be developed rapidly by *in vitro* methods, with the reproducibility of chemical synthesis and inherent stability of modified oligonucleotides. A full battery of base, sugar and internucleotide modifications is available for aptamer development.

2'-F-RNA has been used extensively in aptamer development, as well as 2'-F-ANA more recently. An article in The Glen Report by Jeff Carter, Director, Process Chemistry, SomaLogic, Inc. described¹ the use of a DNA backbone with 5-substituted dU analogues as low off-rate modified aptamer (SOMAmer®) reagents to enable multiplexed screening of thousands of serum or plasma proteins. These aptamers also include PC Biotin along with a fluorophore, in this case Cyanine 3, for subsequent detection.

REFERENCE

- (1) J. Carter, *The Glen Report*, 2015, **27.1**, 6-8.

RELATED

| | |
|--|-----|
| 2'-F-RNA Phosphoramidites.. | 151 |
| 2'-F-Arabinonucleic Acid (2'-F-ANA)..... | 152 |
| PC Biotin Phosphoramidite.... | 108 |
| Cyanine 3 Phosphoramidite ... | 114 |

TERMINUS MODIFIERS

INTELLECTUAL PROPERTY

5'-Carboxy-Modifier C10 is offered for sale under license from TriLink BioTechnologies, Inc. It is intended for research and development purposes only, and may not be used for commercial, clinical, diagnostic or any other use. It is covered under US Patent No. 6,320,041.

RELATED

PC modifiers 94

ABBREVIATIONS

CNEt = Cyanoethyl
 CPG = Controlled Pore Glass
 DMT = 4,4'-Dimethoxytrityl
 Fmoc = Fluorenylmethoxycarbonyl
 iPr = Isopropyl
 MMT = 4-Monomethoxytrityl
 T = Trityl
 TFA = Trifluoroacetyl

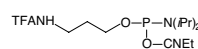
Glen Research 5'-Modifiers are designed for use in DNA synthesizers to functionalize the 5'-terminus of the target oligonucleotide. The 5'-Amino-Modifiers are available with a variety of chain lengths to fit exactly the desired application.

The DMS(O)MT-protected amino group is easier to deprotect compared to the MMT-protected one. The sulfoxy derivative survives conditions of oligonucleotide synthesis and can either be cleaved with standard deblock solution, or left intact for HPLC purification. At the same time, the DMS(O)MT group is fully compatible with cartridge purification. When detritylation on a cartridge is carried out, the DMS(O)MT+, which is more stable than MMT+, does not reattach itself to an amine. We now offer 5'-DMS(O)MT-Amino-Modifier C6 utilizing this new trityl based protecting group.

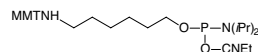
5'-Amino-Modifier TEG, a hydrophilic triethylene glycol ethylamine derivative, is 12 atoms in length and fully soluble in aqueous media.

Methacrylate C6 Phosphoramidite is a terminus modifier that attaches a methacrylate functional group to an oligonucleotide.

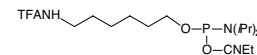
| Item | Catalog No. | Pack |
|---------------------------------|--------------------------|-------------------------|
| 5'-Amino-Modifier C3-TFA | 10-1923-90 10-1923-02 | 100 μ mole 0.25g |
| 5'-Amino-Modifier C6 | 10-1997-90 10-1906-02 | 100 μ mole 0.25g |
| 5'-Amino-Modifier C6-TFA | 10-1916-90 10-1916-02 | 100 μ mole 0.25g |
| 5'-Amino-Modifier C12 | 10-1912-90 10-1912-02 | 100 μ mole 0.25g |
| 5'-Amino-Modifier 5 | 10-1905-90 10-1905-02 | 100 μ mole 0.25g |
| 5'-DMS(O)MT-Amino-Modifier C6 | 10-1907-90 10-1907-02 | 100 μ mole 0.25g |
| 5'-Amino-Modifier TEG | 10-1917-90 10-1917-02 | 100 μ mole 0.25g |
| Methacrylate C6 Phosphoramidite | 10-1891-90 10-1891-02 | 100 μ mole 0.25g |



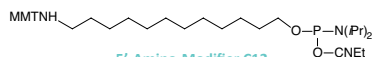
5'-Amino-Modifier C3-TFA



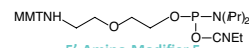
5'-Amino-Modifier C6



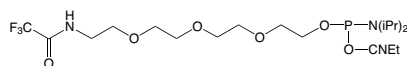
5'-Amino-Modifier C6-TFA



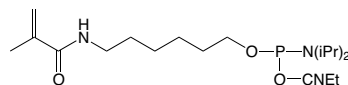
5'-Amino-Modifier C12



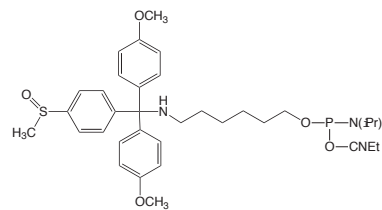
5'-Amino-Modifier 5



5'-Amino-Modifier TEG



Methacrylate C6 Phosphoramidite



5'-DMS(O)MT-Amino-Modifier C6

TERMINUS MODIFIERS (CONT.)

Cleavable linkers have a wide range of application uses. We now offer Universal-CE, a dual-purpose linker capable of revealing 3'-OH termini or serving as a 5'-amino modifier C3 upon cleavage. Used as a universal phosphoramidite, the resulting oligonucleotides with a 3'-OH may be crucial for downstream applications, such as primer extension or ligation assays. Used as an amino modifier, the resulting oligonucleotides would be identical to those generated with 5'-Amino-Modifier C3-TFA.

| Item | Catalog No. | Pack |
|---------------------------|-------------|----------------|
| Universal Phosphoramidite | 10-5000-90 | 100 μ mole |
| | 10-5000-02 | 0.25g |

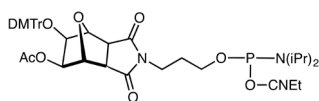
Our more recent 5'-amino modifiers, protected by a novel phthalic acid diamide (PDA) protecting group, are stable solids. In contrast to the TFA protected amino modifiers, which are viscous oils, the analogous PDA protected compounds are granular powders. This important property of these compounds allows straightforward handling, storage and aliquoting and leads to a significant increase in stability.

Deprotection with methylamine in gas phase or aqueous solution or AMA leads to fast and complete removal of the PDA protecting group. However, ammonium hydroxide will not drive the equilibrium reaction to completion and only partial deprotection occurs - overnight deprotection with ammonium hydroxide will yield around 80% active amine.

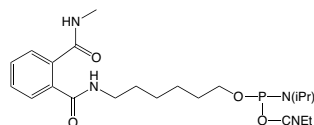
We are offering three PDA Amino-Modifiers:

- 5'-Amino-Modifier C6-PDA
- Hydrophobic 5'-Amino-Modifier C12-PDA
- Hydrophilic 5'-Amino-Modifier-TEG-PDA

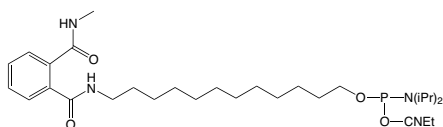
| Item | Catalog No. | Pack |
|---------------------------|-------------|----------------|
| 5'-Amino-Modifier C6-PDA | 10-1947-90 | 100 μ mole |
| | 10-1947-02 | 0.25g |
| 5'-Amino-Modifier C12-PDA | 10-1948-90 | 100 μ mole |
| | 10-1948-02 | 0.25g |
| 5'-Amino-Modifier-TEG-PDA | 10-1949-90 | 100 μ mole |
| | 10-1949-02 | 0.25g |



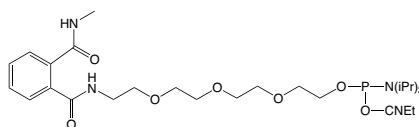
Universal Phosphoramidite



5'-Amino-Modifier C6-PDA



5'-Amino-Modifier C12-PDA



5'-Amino-Modifier-TEG-PDA

INTELLECTUAL PROPERTY

PDA amino-modifiers were developed by Stefan Pitsch and ReseaChem GmbH (S. Berger), and covered by Patent US9534003B2.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

TERMINUS MODIFIERS (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers
For Instrument type *Add*

Expedite E
MerMade M

Columns
For Instrument type *Add*

Expedite E
Applied Biosystems 3900 A
MerMade M

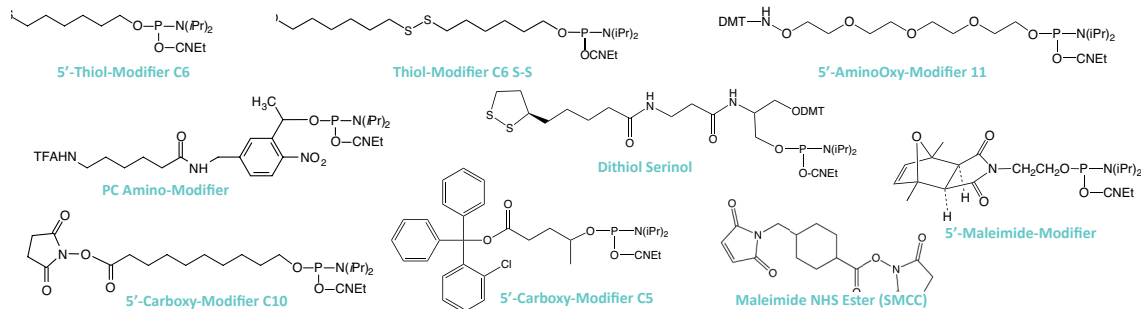
(Please inquire for availability of vials and columns for other instrument types.)

INTELLECTUAL PROPERTY

5'-Maleimide Modifier Phosphoramidite is protected by a patent application and is offered by Glen Research under a non-exclusive license agreement from the University of Barcelona.

The disulfide thiol modifier may be used for introducing 3'- or 5'-thiol linkages. Dithiol Serinol, produced from lipoic acid and our patented serinol backbone, allows easy connection of multiply dithiol-labeled oligos to gold surfaces. 5'-Carboxy-Modifier C10 is a unique linker designed to be added at the terminus of an oligonucleotide synthesis. It generates an activated carboxylic acid N-hydroxysuccinimide (NHS) ester suitable for immediate conjugation on the synthesis column with molecules containing a primary amine, resulting in a stable amide linkage. An alternative carboxylate protecting group is the 2-chlorotrityl group, which is simply removed using the standard deblock cycle to generate a free carboxyl group on an otherwise fully protected oligonucleotide. The 2-chlorotrityl group is also removed during oligo deprotection with ammonium hydroxide or AMA and is incompatible with RP purification techniques. PC Amino-Modifier is a photocleavable C6 amino-modifier, part of our line of photocleavable (PC) modifiers. 5'-AminoOxy-Modifier 11 is based on a tetraethylene glycol linkage for improved solubility and for reducing the potential negative impact on hybridization of the oligo. The oxime formed from the reaction of alkyloxyamines with aldehydes creates a stable covalent bond. In comparison, the imine formed by the conjugation of primary amines with aldehydes is not stable to acidic or basic conditions and requires subsequent reduction with borohydride to form stable amine conjugates. 5'-Maleimide Modifier Phosphoramidite, developed at the University of Barcelona, incorporates a maleimide cycloadduct that is stable to ammonium hydroxide at room temperature. This phosphoramidite can be incorporated into DNA and RNA with both phosphate and phosphorothioate linkages. A retro-Diels-Alder reaction deprotects the maleimide immediately prior to conjugation.

| Item | Catalog No. | Pack |
|---------------------------------------|--|--|
| 5'-Thiol-Modifier C6 | 10-1926-90 10-1926-02 | 100 μ mole 0.25g |
| Thiol-Modifier C6 S-S | 10-1936-90 10-1936-02 | 100 μ mole 0.25g |
| Dithiol Serinol Phosphoramidite | 10-1991-95 10-1991-90 10-1991-02 | 50 μ mole 100 μ mole 0.25g |
| PC Amino-Modifier Phosphoramidite | 10-4906-90 10-4906-02 | 100 μ mole 0.25g |
| 5'-Carboxy-Modifier C10 | 10-1935-90 10-1935-02 | 100 μ mole 0.25g |
| 5'-Carboxy-Modifier C5 | 10-1945-90 10-1945-02 | 100 μ mole 0.25g |
| 5'-AminoOxy-Modifier 11 | 10-1919-95 10-1919-90 10-1919-02 | 50 μ mole 100 μ mole 0.25g |
| 5'-Maleimide-Modifier Phosphoramidite | 10-1938-90 10-1938-02 | 100 μ mole 0.25g |
| Maleimide NHS Ester (SMCC) | 50-1938-23 | 3.3 mg |



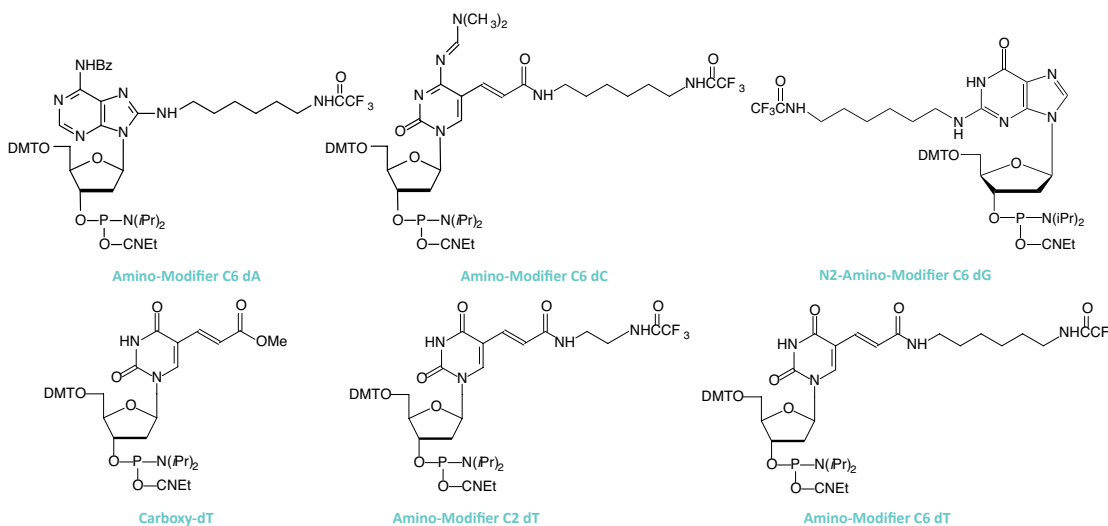
SEQUENCE MODIFIERS

Sequence Modifiers are designed for use in automated synthesis. The carboxy-dT is hydrolyzed during deprotection and can be coupled directly to a molecule containing a primary amino group by a standard peptide coupling or via the intermediate N-hydroxysuccinimide (NHS) ester. Amino-Modifier dA, Amino-Modifier dC, N2-Amino-Modifier dG and both Amino-Modifier dT products can be added in place of a dA, dC, dG and dT residue, respectively, during oligonucleotide synthesis. Corresponding Amino-Modifier supports can replace their respective deoxynucleoside supports. After deprotection, the primary amine on the C6 analogues is separated from the oligonucleotide by a spacer arm with a total of 7-10 atoms and can be labeled or attached to an enzyme. The C2 analogue is more suitable for the attachment of molecules designed to react with the oligonucleotide.

RELATED

Amino-Modifier supports..... 86

| Item | Catalog No. | Pack |
|-------------------------|-------------|----------------|
| Amino-Modifier C6 dA | 10-1089-90 | 100 μ mole |
| | 10-1089-02 | 0.25g |
| Amino-Modifier C6 dC | 10-1019-90 | 100 μ mole |
| | 10-1019-02 | 0.25g |
| N2-Amino-Modifier C6 dG | 10-1529-95 | 50 μ mole |
| | 10-1529-90 | 100 μ mole |
| | 10-1529-02 | 0.25g |
| Carboxy-dT | 10-1035-90 | 100 μ mole |
| | 10-1035-02 | 0.25g |
| Amino-Modifier C2 dT | 10-1037-90 | 100 μ mole |
| | 10-1037-02 | 0.25g |
| | 10-1037-05 | 0.5g |
| Amino-Modifier C6 dT | 10-1039-90 | 100 μ mole |
| | 10-1039-02 | 0.25g |
| | 10-1039-05 | 0.5g |



SEQUENCE MODIFIERS (CONT.)

RELATED

Carboxy-Modifiers82

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

For Instrument type *Add*

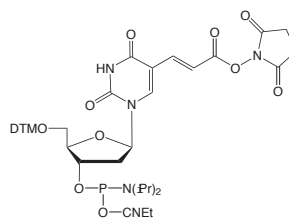
Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

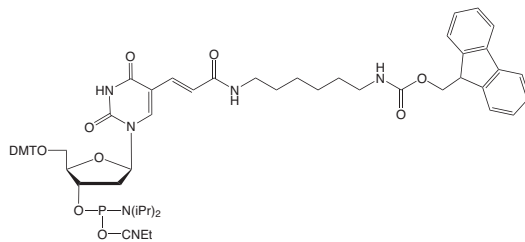
Our repertoire of NHS ester derivatives has been expanded to include the NHS-Carboxy-dT-CE Phosphoramidite. By making a dT analog of the Carboxy-Modifier C10, it is possible to label one or multiple sites within an oligonucleotide. This opens up the possibility to label any number of different dyes or molecules within an oligonucleotide when the phosphoramidite is unavailable. Doing so is straightforward and may be done manually off the synthesizer or even in a fully-automated manner on the DNA synthesizer.

We have never found conditions which allow the TFA group to be removed from an amino-modifier while the oligonucleotide remains attached to the support. We are able to solve this problem by using a 9-fluorenylmethoxycarbonyl (Fmoc) protecting group. The Fmoc group is removed using a two step procedure, the first to remove the cyanoethyl protection groups and flush the formed acrylonitrile from the synthesis column using 1% diisopropylamine in acetonitrile, and the second to remove the Fmoc group using 10% piperidine in DMF. The amino group so formed on the column can be reacted with a variety of activated esters. We offer Fmoc-Amino-Modifier C6 dT Phosphoramidite as a nucleosidic option and Amino-Modifier Serinol Phosphoramidite as a non-nucleosidic alternative. We also offer S-Bz-Thiol-Modifier C6-dT to join the ranks of thiol-modifiers for oligonucleotide synthesis. Thiol-Modifier C6-dT can be added as usual at the desired locations within a sequence.

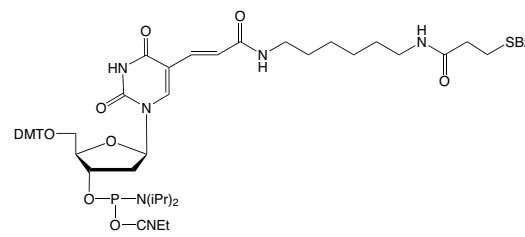
| Item | Catalog No. | Pack |
|---------------------------|--|--|
| NHS-Carboxy-dT | 10-1535-90 10-1535-02 | 100 μ mole 0.25g |
| Fmoc-Amino-Modifier C6 dT | 10-1536-90 10-1536-02 | 100 μ mole 0.25g |
| S-Bz-Thiol-Modifier C6-dT | 10-1538-95 10-1538-90 10-1538-02 | 50 μ mole 100 μ mole 0.25g |



NHS-Carboxy-dT



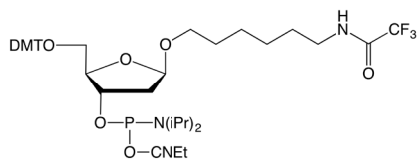
Fmoc-Amino-Modifier C6 dT



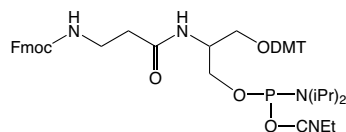
S-Bz-Thiol-Modifier C6-dT

SEQUENCE MODIFIERS (CONT.)

| Item | Catalog No. | Pack |
|--|-------------|----------------|
| Amino-Modifier C6 dR | 10-1911-95 | 50 μ mole |
| | 10-1911-90 | 100 μ mole |
| | 10-1911-02 | 0.25g |
| Amino-Modifier Serinol Phosphoramidite | 10-1997-95 | 50 μ mole |
| | 10-1997-90 | 100 μ mole |
| | 10-1997-02 | 0.25 |



Amino-Modifier C6 dR



Amino-Modifier Serinol Phosphoramidite

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

For Instrument type *Add*

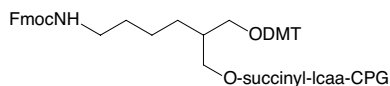
Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

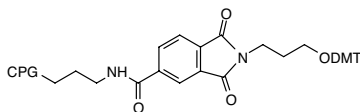
3'-MODIFIERS

3'-Amino-Modifier CPGs, containing amino groups protected with the base-labile Fmoc group, are designed to functionalize the 3'-terminus of the target oligonucleotide by the introduction of a primary amine. In an alternative approach, the nitrogen destined to become the 3'-amino group is included in a phthalimide (PT) group which is attached to the support through an amide group attached to the aromatic ring. This simple linkage is very stable to all conditions of oligonucleotide synthesis and contains no chiral center. Using an extended ammonium hydroxide treatment (55°C for 17 hours), the cleavage of the amine from the phthalimide is accomplished along with the deprotection of the oligonucleotide. ABI-style columns are supplied unless otherwise requested.

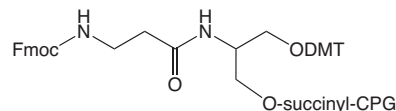
| Item | Cat. No. | Pack |
|---------------------------------|----------------------------|-----------|
| 3'-Amino-Modifier C7 CPG 1000 | 20-2958-01 | 0.1g |
| | 20-2958-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2958-14 | Pack of 1 |
| 3'-Amino-Modifier Serinol CPG | 20-2997-01 | 0.1g |
| | 20-2997-10 | 1.0g |
| | 0.2 μ mole columns | Pack of 4 |
| | 1 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2997-14 | Pack of 1 |
| 3'-PT-Amino-Modifier C3 CPG | 20-2954-01 | 0.1g |
| | 20-2954-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2954-14 | Pack of 1 |



3'-Amino-Modifier C7 CPG



3'-PT Amino-Modifier C3 CPG

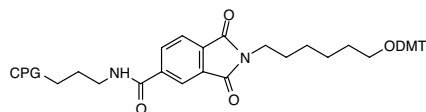


3'-Amino-Modifier Serinol CPG

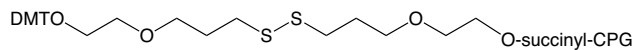
3'-MODIFIERS (CONT.)

The 3'-Thiol-Modifier S-S CPG supports are used to introduce 3'-thiol linkages with three and six atom spacers into oligonucleotides. 3'-Dithiol Serinol CPG is used to introduce a dithiol group at the 3'-terminus. In conjunction with Dithiol Serinol Phosphoramidite, it is simple to produce oligonucleotides with multiple thiol groups at the 3' terminus, which is ideal for conjugation to gold surfaces. With Glyceryl CPG the 3'-terminus of an oligonucleotide is readily oxidized by sodium periodate to form a 3'-phosphoglycaldehyde. The aldehyde may be further oxidized to the corresponding carboxylic acid. Either the aldehyde or the carboxylate may be used for subsequent conjugation to amine-containing products.

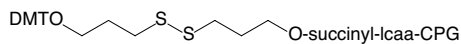
| Item | Cat. No. | Pack |
|------------------------------|------------------------------|------------|
| 3'-PT-Amino-Modifier C6 CPG | 20-2956-01 | 0.1g |
| | 20-2956-10 | 1.0g |
| | 1 μmole columns | Pack of 4 |
| | 0.2 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2956-14 | Pack of 1 |
| 3'-PT-Amino-Modifier C6 PS | 26-2956-01 | 0.1g |
| | 26-2956-10 | 1.0g |
| | 200 nmole columns (ABI 3900) | Pack of 10 |
| 40 nmole columns (ABI 3900) | 26-2956-55 | Pack of 10 |
| 3'-Thiol-Modifier C3 S-S CPG | 20-2933-01 | 0.1g |
| | 20-2933-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2933-14 | Pack of 1 |
| 3'-Thiol-Modifier 6 S-S CPG | 20-2938-01 | 0.1g |
| | 20-2938-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2938-14 | Pack of 1 |



3'-PT Amino-Modifier C6 CPG



3'-Thiol-Modifier 6 S-S CPG



3'-Thiol-Modifier C3 S-S CPG

3'-MODIFIERS (CONT.)

3'-Amino-Modifier C6 dC CPG and 3'-Amino-Modifier C6 dT CPG replace a dC and T, respectively, at the 3'-terminus. These products allow convenient labeling at the 3' without blocking the terminus from desired enzymatic activity.

RELATED

Dithiol Serinol82

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

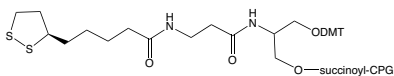
Columns

For Instrument type *Add*

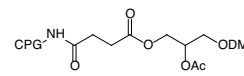
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

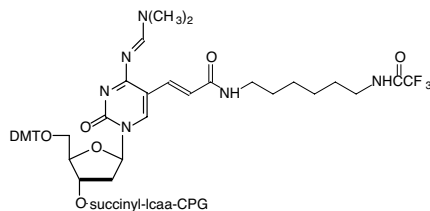
| Item | Cat. No. | Pack |
|---------------------------------|----------------------------|--------------|
| 3'-Dithiol Serinol CPG | 20-2991-01 | 0.1g |
| | 20-2991-10 | 1.0g |
| | 0.2 μ mole columns | Pack of 4 |
| | 1 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2991-14 | Pack of 1 |
| 3'-Glyceryl CPG | 20-2902-01 | 0.1g |
| | 20-2902-10 | 1.0g |
| | 0.2 μ mole columns | Pack of 4 |
| | 1 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2902-14 | Pack of 1 |
| 3'-Amino-Modifier C6 dC CPG | 20-2019 | Discontinued |
| 3'-Amino-Modifier C6 dT CPG | 20-2039-01 | 0.1g |
| | 20-2039-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2039-14 | Pack of 1 |



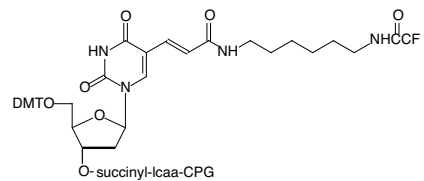
3'-Dithiol Serinol CPG



3'-Glyceryl CPG



Amino-Modifier C6 dC CPG



Amino-Modifier C6 dT CPG

CHEMICAL PHOSPHORYLATION

INTELLECTUAL PROPERTY

Solid Chemical Phosphorylation Reagent II and related supports are covered by European Patent: EP0816368.

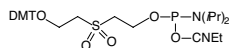
(1) A. Guzaev, H.Salo, A. Azhayev, and H. Lonnberg, *Tetrahedron*, 1995, **51**, 9375-9384.

RELATED

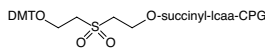
High load supports 33

Chemical Phosphorylation Reagent is most commonly used to phosphorylate the 5'-terminus of an oligonucleotide. Although this product is also successful in 3'-phosphorylation, 3'-Phosphate CPG allows direct preparation of oligonucleotides with a 3'-phosphate group. Chemical Phosphorylation Reagent II contains a DMT group on a side chain which is stable to base cleavage and can be left on the oligonucleotide for use in RP purification. The DMT group is later removed with aqueous acid and the side chain is eliminated after brief treatment with aqueous ammonium hydroxide to yield the 5'-phosphate.¹ Solid CPR II is similar in performance to CPR II but it is easier to prepare aliquots since it is a powder. Many researchers treat synthesis supports with a hindered base (e.g., diethylamine, diisopropylethylamine, or DBU) post-synthesis to eliminate and remove the cyanoethyl phosphate groups. In this way, the acrylonitrile formed in situ is removed from the support and is not available to alkylate dT residues at the N3 position in the oligos. Since the sulfonyl ethyl group in 3'-Phosphate CPG is also susceptible to β -elimination leading to oligo cleavage, this technique is not compatible with 3'-phosphate CPG. Using CPR II CPG, which is base labile but does not support β -elimination, the cyanoethyl groups can be removed from the oligo prior to cleavage and base deprotection. ABI-style vials and columns are supplied unless otherwise requested.

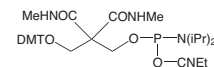
| Item | Cat. No. | Pack |
|----------------------------------|--------------------------|-------------------------|
| Chemical Phosphorylation Reagent | 10-1900-90 10-1900-02 | 100 μ mole 0.25g |
| 3'-Phosphate CPG | 20-2900-01 20-2900-10 | 0.1g 1.0g |
| 1 μ mole columns | 20-2900-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2900-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-2900-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2900-14 | Pack of 1 |
| 3'-Phosphate PS | 26-2900-01 26-2900-10 | 0.1g 1.0g |
| 200 nmole columns (ABI 3900) | 26-2900-52 | Pack of 10 |
| 40 nmole columns (ABI 3900) | 26-2900-55 | Pack of 10 |
| 3'-Phosphate CPG (High Load) | 25-2900-01 25-2900-10 | 0.1g 1.0g |
| 2.5 μ mole columns | 25-2900-46 | Pack of 4 |



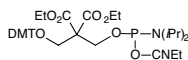
Chemical Phosphorylation Reagent



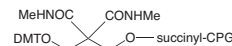
3'-Phosphate CPG



Solid Chemical Phosphorylation Reagent II



Chemical Phosphorylation Reagent II



3'-CPR II CPG

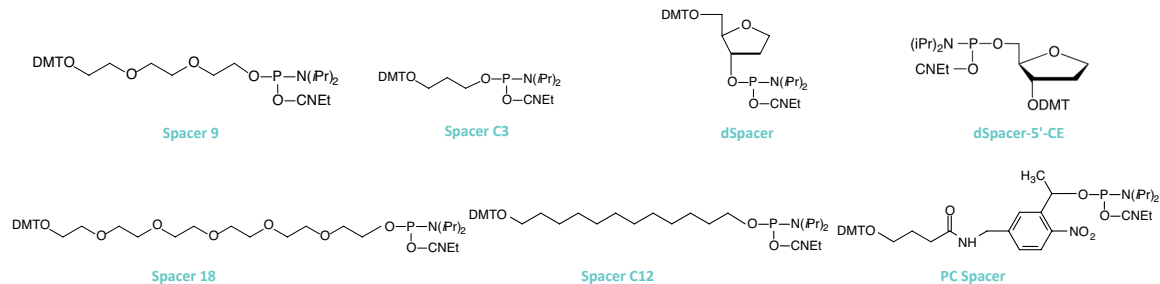
SPACER MODIFIERS

RELATED

| | |
|-------------------|----|
| PC Modifiers..... | 94 |
| Pyrrolidine..... | 69 |

The spacer phosphoramidites C3, 9, C12 and 18 are used to insert a spacer arm in an oligonucleotide. The compounds may be added in multiple additions when a longer spacer is required. 3'-Spacer C3 CPG may also act as a blocker of exonuclease and polymerase activity at the 3'-terminus. dSpacer is used to introduce a stable abasic site within an oligonucleotide. PC Spacer is a photocleavable C3 spacer modifier, part of our line of photocleavable (PC) modifiers.

| Item | Cat. No. | Pack |
|-------------------------------|---------------------------------|----------------|
| Spacer Phosphoramidite 9 | 10-1909-90 | 100 μ mole |
| | 10-1909-02 | 0.25g |
| Spacer Phosphoramidite C3 | 10-1913-90 | 100 μ mole |
| | 10-1913-02 | 0.25g |
| dSpacer CE Phosphoramidite | 10-1914-90 | 100 μ mole |
| | 10-1914-02 | 0.25g |
| dSpacer-5'-CE Phosphoramidite | 10-4191-90 | 100 μ mole |
| | 10-4191-02 | 0.25g |
| Spacer Phosphoramidite 18 | 10-1918-90 | 100 μ mole |
| | 10-1918-02 | 0.25g |
| Spacer C12 CE Phosphoramidite | 10-1928-90 | 100 μ mole |
| | 10-1928-02 | 0.25g |
| 3'-Spacer C3 CPG | 20-2913-01 | 0.1g |
| | 20-2913-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| | 15 μ mole column (Expedite) | Pack of 1 |
| PC Spacer Phosphoramidite | 10-4913-90 | 100 μ mole |
| | 10-4913-02 | 0.25g |



DENDRIMERS

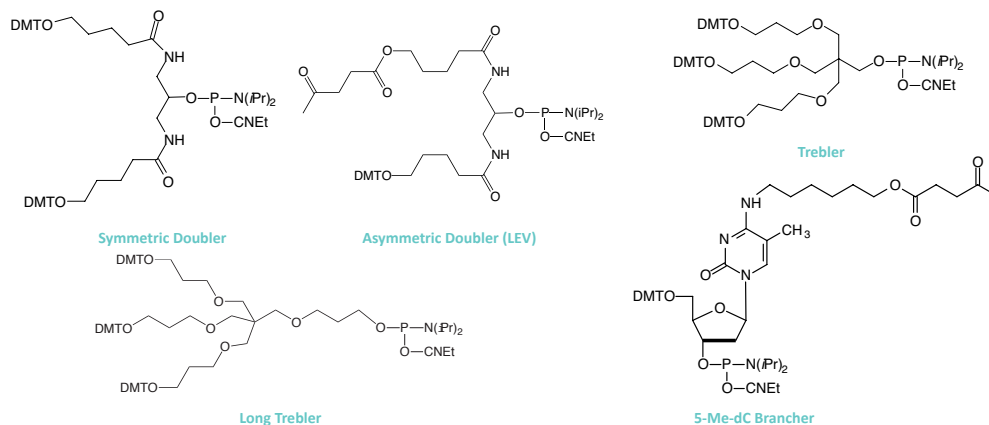
Dendrimers are discrete, highly branched, monodispersed polymers that possess patterns reminiscent of the branching of trees. Plain and mixed oligonucleotide dendrimers can be synthesized using novel doubling and trebling phosphoramidite synthons.^{1,2} Dendrimers offer the following advantages. Incorporation of label using γ -32P-ATP and polynucleotide kinase increases in proportion to the number of 5'-ends. Fluorescent signal also increases in proportion to the number of 5'-ends, if spacers are incorporated between the labels and the ends of the branches. When using a dendrimeric oligonucleotide as a PCR primer, the strand bearing the dendrimer is resistant to degradation by T7 Gene 6 exonuclease making it easy to convert the double-stranded product of the PCR to a multiply labeled, single-stranded probe. Enhanced stability of DNA dendrimers makes them useful as building blocks for the 'bottom up' approach to nano-assembly. These features also suggest applications in DNA chip technology when higher temperatures are required, for example, to melt secondary structure in the target.

| Item | Catalog No. | Pack |
|--|-------------|----------------|
| Symmetric Doubler Phosphoramidite | 10-1920-90 | 100 μ mole |
| | 10-1920-02 | 0.25g |
| Asymmetric Doubler (LEV) Phosphoramidite | 10-1981-90 | 100 μ mole |
| | 10-1981-02 | 0.25g |
| Trebler Phosphoramidite | 10-1922-90 | 100 μ mole |
| | 10-1922-02 | 0.25g |
| Long Trebler Phosphoramidite | 10-1925-90 | 100 μ mole |
| | 10-1925-02 | 0.25g |

BRANCHING PHOSPHoramidite

A branching monomer is required to construct comb-like oligonucleotide probes. The developers of the comb system from Chiron Corporation evaluated³ several protecting groups for the branch point and chose levulinyl (LEV), which is specifically removed using a reagent containing hydrazine hydrate, acetic acid and pyridine.

| Item | Catalog No. | Pack |
|----------------------------------|-------------|----------------|
| 5-Me-dC Brancher Phosphoramidite | 10-1018-90 | 100 μ mole |
| | 10-1018-02 | 0.25g |



OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type Add

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

REFERENCES

- (1) M.S. Shchepinov, I.A. Udalova, A.J. Bridgman, and E.M. Southern, *Nucleic Acids Res*, 1997, **25**, 4447-4454.
- (2) M.S. Shchepinov, K.U. Mir, J.K. Elder, M.D. Frank-Kamenetskii, and E.M. Southern, *Nucleic Acids Res*, 1999, **27**, 3035-41.
- (3) T. Horn, C.A. Chang, and M.S. Urdea, *Nucleic Acids Res*, 1997, **25**, 4842-4849.

PHOTOCLEAVABLE MONOMERS

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

INTELLECTUAL PROPERTY

PC Linker phosphoramidite is available from Glen Research in association with Link Technologies Ltd (Scotland).

RELATED

5'-Biotin 107

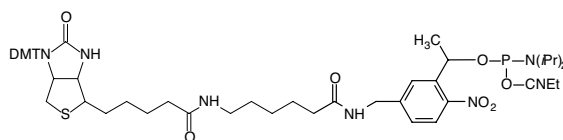
REFERENCES

- P. Ordoukhanian and J-S. Taylor, *J. Am. Chem. Soc.*, **117**, 9570-9571, 1995.
- (2a) F. Hausch and A. Jäschke, *Nucleic Acids Research*, 2000, **28**, e35.
- (2b) F. Hausch and A. Jäschke, *Tetrahedron*, 2001, **57**, 1261-1268.
- T. Wenzel, T. Ellsner, K. Fahr, J. Bimmmler, S. Richter, I. Thomas, and M. Kostrzewa, *Nucleosides, Nucleotides & Nucleic Acids*, 2003, **22**, 1579-1581.

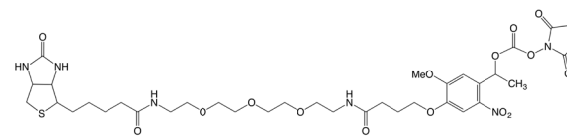
PC Biotin Phosphoramidite can be used to prepare 5'-biotinylated oligonucleotides suitable for capture by streptavidin in a mode similar to our popular 5' Biotin Phosphoramidite. Amino- and thiol-modified oligonucleotides have proven to be very useful for the attachment of a variety of haptens and fluorophores, as well as for the tethering of the oligonucleotides to a diversity of beads and surfaces. PC Amino-Modifier Phosphoramidite is used to prepare 5'-amino-modified oligonucleotides suitable for subsequent photocleavage. PC Spacer Phosphoramidite can be used as an intermediary to attach any modification reagent, available as a phosphoramidite, to the terminus of oligonucleotides. After photocleavage, a 5'-phosphate is generated on the DNA, rendering it suitable for further biological transformations, such as gene construction and cloning after ligation.

A versatile photocleavable DNA building block has been described by researchers in Washington University, Missouri and used in phototriggered hybridization.¹ This reagent has also been used in the design of multifunctional DNA and RNA conjugates² for the in vitro selection of new molecules catalyzing biomolecular reactions. Researchers at Bruker Daltonik in Germany have also developed genoSNIP, a method for single-nucleotide polymorphism (SNP) genotyping by MALDI-TOF mass spectrometry.³ This method uses size reduction of primer extension products by incorporation of the photocleavable linker for phototriggering strand breaks near to the 3' end of the extension primer. PC Linker can be incorporated into oligonucleotides at any position by standard automated DNA synthesis methodology. PC Linker Phosphoramidite has the added advantage in that photocleavage results in monophosphate fragments at both the 3'- and 5'-termini of the oligonucleotide fragments.

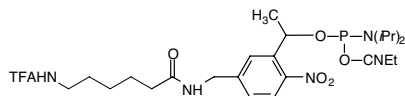
| Item | Catalog No. | Pack |
|-----------------------------------|-------------|-----------|
| PC Biotin Phosphoramidite | 10-4950-95 | 50 µmole |
| | 10-4950-90 | 100 µmole |
| | 10-4950-02 | 0.25g |
| PC Biotin NHS Ester | 50-4950-22 | 4.2 mg |
| PC Amino-Modifier Phosphoramidite | 10-4906-90 | 100 µmole |
| | 10-4906-02 | 0.25g |
| PC Spacer Phosphoramidite | 10-4913-90 | 100 µmole |
| | 10-4913-02 | 0.25g |
| PC Linker Phosphoramidite | 10-4920-90 | 100 µmole |
| | 10-4920-02 | 0.25g |



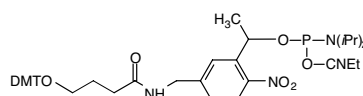
PC Biotin



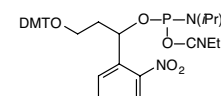
PC Biotin NHS Ester



PC Amino-Modifier



PC Spacer



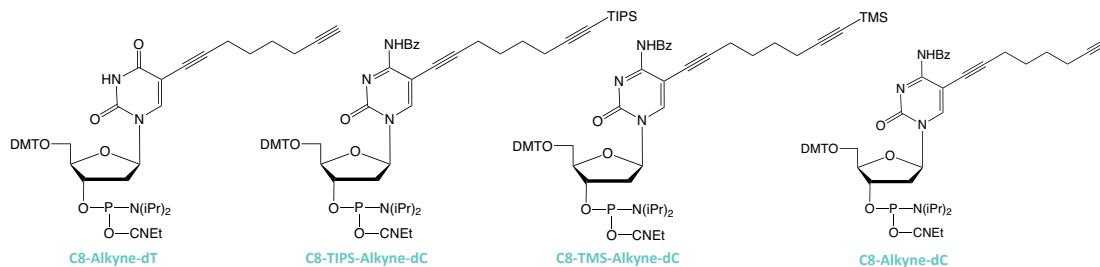
PC Linker

CONJUGATION USING CLICK CHEMISTRY

The copper(I)-catalyzed azide-alkyne cycloaddition (CuAAC) reaction between azides and alkynes to form 1,2,3-triazoles, as reported¹ by Sharpless, was found to be so exquisitely regioselective and efficient at even the most mild conditions that Sharpless coined the term 'Click Chemistry' to describe it. The use of this method for DNA modification has been somewhat delayed by the fact that copper ions damage DNA, typically yielding strand breaks.² As these problems have now been overcome by the use of copper(I)-stabilizing ligands (e.g., tris(benzyltriazolylmethyl)amine, TBTA³), Carell et al. and Seela et al. discovered that the CuAAC reaction can be used to functionalize alkyne-modified DNA nucleobases with extremely high efficiency.⁴

Oligonucleotides bearing a single nucleosidic alkyne group can be prepared using a C8-Alkyne-dC or dT-CE Phosphoramidite. Purified oligonucleotides are usually modified with 2-5 equivalents of the corresponding marker-azide (e.g., fluorescent-dye azides). After the addition of precomplexed Cu(I), complete conversion to the labeled oligo is observed in a time span between 30 min and 4 hours. After a simple precipitation step, labeled oligonucleotides can be recovered in near quantitative yields. Using a combination of C8-Alkyne, C8-TIPS-Alkyne and C8-TMS-Alkyne, it is possible to label oligonucleotides in up to three separate click reactions. The alkyne groups on the last two monomers are protected, respectively, with triisopropylsilyl (TIPS) and trimethylsilyl (TMS) protecting groups.^{5,6} The first click reaction on solid phase on a C8-Alkyne yields the singly modified oligonucleotide with full retention of the TIPS and/or TMS protecting group. For double click, a C8-TIPS-Alkyne is used as the second nucleoside and the TIPS protecting group is cleaved with tetrabutylammonium fluoride (TBAF) without causing any damage to the DNA. The second click reaction in solution yields the doubly modified oligonucleotide in excellent yield. For the introduction of three different labels, all three nucleosides are introduced into oligonucleotides. The first click reaction is performed directly on the resin. The singly modified oligonucleotide is subsequently cleaved from the support with concomitant cleavage of the TMS group and retention of the TIPS protecting group. The second click reaction is performed in solution. Precipitation of the doubly modified oligonucleotide, cleavage of the TIPS group with TBAF, and a subsequent third click reaction in solution furnishes the desired triply modified oligonucleotide in excellent overall yield.

| Item | Catalog No. | Pack |
|--------------------------------------|-------------|--------------|
| C8-Alkyne-dT-CE Phosphoramidite | 10-1540-95 | 50 µmole |
| | 10-1540-90 | 100 µmole |
| | 10-1540-02 | 0.25g |
| C8-TIPS-Alkyne-dC-CE Phosphoramidite | 10-1541 | Discontinued |
| C8-TMS-Alkyne-dC-CE Phosphoramidite | 10-1542 | Discontinued |
| C8-Alkyne-dC-CE Phosphoramidite | 10-1543-95 | 50 µmole |
| | 10-1543-90 | 100 µmole |
| | 10-1543-02 | 0.25g |



REFERENCES

- [1] C.W. Tornøe, C. Christensen, M. Meldal, *J. Org. Chem.* 2002, **67**, 3057-3064; V. V. Rostovtsev, L. G. Green, V. V. Fokin, K. B. Sharpless, *Angew. Chem.* 2002, **114**, 2708-2711; *Angew. Chem. Int. Ed.* 2002, **41**, 2596-2599.
- [2] C. J. Burrows, J. G. Muller, *Chem. Rev.* 1998, **98**, 1109 - 1151.
- [3] T. R. Chan, R. Hilgraf, K. B. Sharpless, V. V. Fokin, *Org. Lett.* 2004, **6**, 2853 - 2855.
- [4] J. Gierlich, G. A. Burley, P. M. E. Gramlich, D. M. Hammond, T. Carell, *Org. Lett.* 2006, **8**, 3639-3642; F. Seela, V. R. Sirivolu, *Chem. Biodiversity* 2006, **3**, 509-514.
- [5] P. M. E. Gramlich, S. Warncke, J. Gierlich, T. Carell, *Angew. Chem.* 2008, **120**, 3491-3493; *Angew. Chem. Int. Ed.* 2008, **47**, 3442-3444.
- [6] P. M. E. Gramlich, C. T. Wirges, A. Manetto, T. Carell, *Angew. Chem. Int. Ed.* 2008, **47**, 8350-8358.

INTELLECTUAL PROPERTY

baseclick GmbH has been granted the following patents (1-3) besides its further patent applications (4-5).

1. WO 2006/117161 (New labeling strategies for the sensitive detection of analytes)
2. WO 2008/952775 (Click chemistry for the production of reporter molecules)
3. WO 2010/115957 (Click Chemistry on heterogeneous catalysts)
4. PCT/EP 2013/064610 (Anandamide-modified nucleic acid molecules)
5. PCT/EP 2015/056007 (Self-assembly of DNA Origami: a diagnostic tool)

baseclick GmbH holds a worldwide exclusive license for granted patent application WO 03/101972 (Copper-catalysed ligation of azides and acetylenes for the nucleic acid field) in the area of diagnostics and research.

As Glen Research and baseclick are partners, Glen Research is now able to help in sublicensing this outstanding technology.

CONJUGATION USING CLICK CHEMISTRY (CONT.)

RELATED

3'-Propargyl-5-Me-dC CPG.....70

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

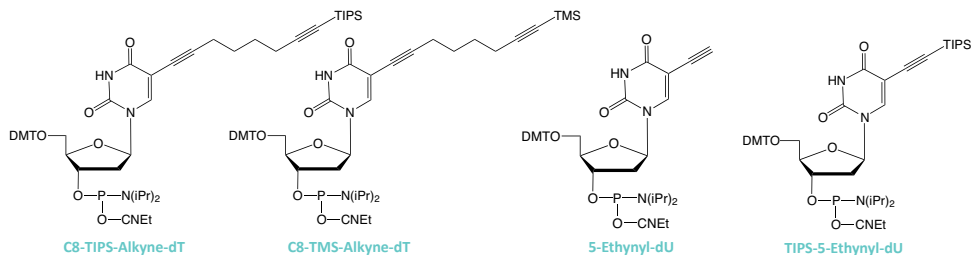
For Instrument type Add

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

5-Ethynyl-dU offers convenient click conjugation with an azide to generate a label rigidly attached to one of the oligonucleotide bases. 5-Ethynyl-dU is subject to base-catalyzed hydration during cleavage and deprotection, especially when using a strong base or heat. Hydration of an ethynyl group forms a methyl ketone which subsequently blocks potential click reactions. Mild deprotection conditions are necessary when using 5-Ethynyl-dU-CE Phosphoramidite to prevent this side reaction. TIPS-5-Ethynyl-dU-CE Phosphoramidite, containing a protected alkyne, offers broader compatibility with oligonucleotide synthesis and deprotection. Protecting the 5-ethynyl group with a triisopropylsilyl (TIPS) protecting group prevents acid or base catalyzed hydration during oligonucleotide synthesis and workup. A quick treatment with TBAF removes the TIPS protecting group.

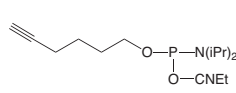
| Item | Catalog No. | Pack |
|--------------------------------------|-------------|----------------|
| C8-TIPS-Alkyne-dT-CE Phosphoramidite | 10-1544 | Discontinued |
| C8-TMS-Alkyne-dT-CE Phosphoramidite | 10-1545 | Discontinued |
| 5-Ethynyl-dU-CE Phosphoramidite | 10-1554-95 | 50 μ mole |
| | 10-1554-90 | 100 μ mole |
| | 10-1554-02 | 0.25g |
| TIPS-5-Ethynyl-dU-CE Phosphoramidite | 10-1555-95 | 50 μ mole |
| | 10-1555-90 | 100 μ mole |
| | 10-1555-02 | 0.25g |
| THPTA Ligand (Water soluble) | 50-1004-92 | 25 μ mole |
| | 50-1004-90 | 100 μ mole |
| Click-Solution (DMSO/t-BuOH) | 50-1002-11 | 10 x 1.0mL |



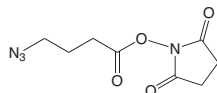
CONJUGATION USING CLICK CHEMISTRY (CONT.)

Oligonucleotides prepared using 5'-Hexynyl Phosphoramidite are stable to standard deprotection conditions and exhibit a slightly increased retention time on RP HPLC. Azides are not compatible with oligonucleotide synthesis using phosphoramidites so a post-synthesis reaction is required. Azidobutyrate NHS Ester is used¹ for azido-modification of amines at either the 3'-end or the 5'-end of an oligo and it can even be used for internal modification on an Amino-Modifier-C6 dX residue within the sequence. Specific to the 5'-terminus, 5'-Bromoethyl Phosphoramidite is added in the last cycle. This modifier can then be easily transformed into a 5'-azido group by displacement of bromide using sodium azide.² Alkyne NHS ester allows the functionalization of an amino moiety in a variety of molecules, including DNA and RNA oligonucleotides as well as peptides or proteins. We also offer two products for use in Click Chemistry based upon our 1,3-diol product portfolio with the serinol backbone - a phosphoramidite for adding an alkyne group at the 5' terminus or within the sequence, and a synthesis support for labeling the 3' terminus of oligonucleotides with an alkyne group.

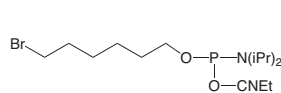
| Item | Catalog No. | Pack |
|---|-------------|-----------|
| 5'-Hexynyl Phosphoramidite | 10-1908-90 | 100 µmole |
| | 10-1908-02 | 0.25g |
| Azidobutyrate NHS Ester (Dissolve 2.3mg in 60µL of DMSO) | 50-1904-23 | 2.3mg |
| | 50-1904-24 | 23mg |
| 5'-Bromoethyl Phosphoramidite | 10-1946-90 | 100 µmole |
| | 10-1946-02 | 0.25g |
| Alkyne-NHS Ester (Dissolve 2.3mg in 60µL of DMSO) | 50-1905-23 | 2.3mg |
| | 50-1905-24 | 23mg |
| Alkyne-Modifier Serinol Phosphoramidite | 10-1992-95 | 50 µmole |
| | 10-1992-90 | 100 µmole |
| | 10-1992-02 | 0.25g |
| 3'-Alkyne-Modifier Serinol CPG | 20-2992-01 | 0.1g |
| | 20-2992-10 | 1.0g |
| | 20-2992-42 | Pack of 4 |
| | 20-2992-41 | Pack of 4 |
| | 20-2992-13 | Pack of 1 |
| | 20-2992-14 | Pack of 1 |



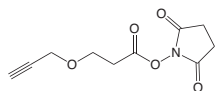
5'-Hexynyl Phosphoramidite



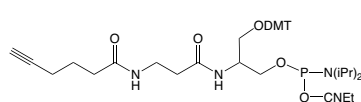
Azidobutyrate NHS Ester



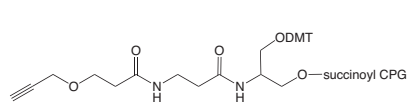
5'-Bromoethyl Phosphoramidite



Alkyne-NHS Ester



Alkyne-Modifier Serinol Phosphoramidite



3'-Alkyne-Modifier Serinol CPG

REFERENCES

- (1) R. Kumar, et al., *Journal of the American Chemical Society*, 2007, **129**, 6859-6864.
- (2) J. Lietard, A. Meyer, J.J. Vasseur, and F. Morvan, *Tetrahedron Letters*, 2007, **48**, 8795-8798.

RELATED

Serinol Products.....102

CONJUGATION USING CLICK CHEMISTRY (CONT.)

RELATED

dSpacer.....92

STABILITY NOTES

Oligonucleotides containing a 5'-iodo group are prepared conventionally with the exception that deprotection is carried out in ammonium hydroxide at room temperature for 24 hours. Under these conditions, degradation of the iodo group was less than 2%.

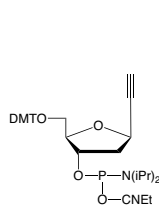
1-Ethynyl-dSpacer CE Phosphoramidite can be used in any position within an oligonucleotide while still retaining the high efficiency of click chemistry. The modifier is efficiently incorporated into oligonucleotides using standard phosphoramidite chemistry, is stable to common deprotection conditions, and is compatible with Glen-Pak™ purification. 1-Ethynyl-dSpacer generates a substituted 1,2,3-triazole pseudo-nucleobase after click chemistry conjugation with an azide. The 1-ethynyl-dSpacer modification exhibits similar duplex stability to the standard dSpacer (10-1914) and destabilizes the duplex when internally incorporated. Upon cycloaddition, the duplex stability is moderated by the resulting structure of the modification. Simple 1,2,3-triazoles were destabilizing, as were modifications that incorporated TEG linkers (6-FAM-TEG and Amino-TEG). Modifications that incorporated aromatic functional groups restored duplex stability to varying degrees with coumarin and psoralen significantly restoring stability. A 5'-iodo-modified oligonucleotide (prepared using 5'-Iodo-dT) can be quantitatively converted to the corresponding 5'-azide.

| Item | Catalog No. | Pack |
|--------------------------------------|-------------|-----------|
| 1-Ethynyl-dSpacer CE Phosphoramidite | 10-1910-95 | 50 μmole |
| | 10-1910-90 | 100 μmole |
| | 10-1910-02 | 0.25g |
| 5'-I-dT-CE Phosphoramidite | 10-1931-90 | 100 μmole |
| | 10-1931-02 | 0.25g |
| 5'-TCO C6 CE Phosphoramidite | 10-1943-95 | 50 μmole |
| | 10-1943-90 | 100 μmole |
| | 10-1943-02 | 0.25g |

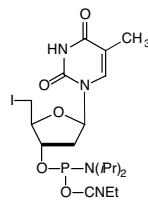
OLIGO-CLICK KITS

Oligo-Click Kits has been discontinued. Please contact technical support.

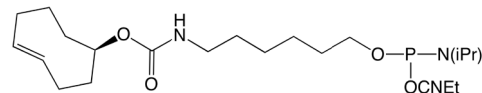
| Item | Catalog No. | Pack |
|-------------------------------------|-------------|--------------|
| baseclick Oligo-Click-M-Reload | 50-2100 | Discontinued |
| baseclick Oligo-Click-M-Biotin | 50-2101 | Discontinued |
| baseclick Oligo-Click-M-Fluorescein | 50-2102 | Discontinued |
| baseclick Oligo-Click-M-TAMRA | 50-2103 | Discontinued |



1-Ethynyl-dSpacer



5'-I-dT



5'-TCO C6

COPPER-FREE CLICK CHEMISTRY

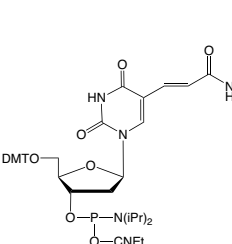
At Glen Research, our goal was to offer a copper-free click phosphoramidite reagent with the following properties:

- Simple to use
- Stable in solution on the synthesizer
- Stable to ammonium hydroxide and AMA
- Excellent click performance in 17 hours or less at room temperature

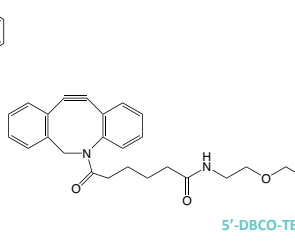
From the variety of cyclooctyne-based copper-free click reagents so far described, we have chosen to offer compounds based on a dibenzo-cyclooctyne (DBCO) structure. We are offering 5'-DBCO-TEG Phosphoramidite for preparing oligos with a 5'-DBCO modification and DBCO-dT-CE Phosphoramidite for inserting a DBCO group at any position within the oligonucleotide. In addition, we offer a further DBCO phosphoramidite – DBCO-Serinol Phosphoramidite. Using our proprietary serinol backbone as a non-nucleosidic spacer allows the DBCO group to be placed at any location within a sequence with multiple additions clearly possible. DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature. Simple desalting on a Glen Gel-Pak™ leads to a product with virtually quantitative conjugation efficiency.

Note: We now recommend that synthesis of oligos containing DBCO-dT be completed using 0.5 M CSO in anhydrous acetonitrile (40-4632-xx). Acceptable results can be achieved with iodine oxidation if DBCO-dT is subjected to no more than 8-10 cycles.

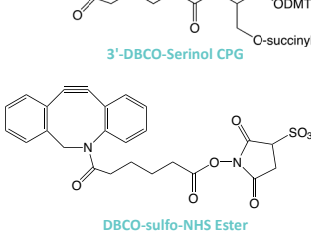
| Item | Catalog No. | Pack |
|--|----------------------------|-----------|
| 5'-DBCO-TEG Phosphoramidite | 10-1941-95 | 50 µmole |
| | 10-1941-90 | 100 µmole |
| | 10-1941-02 | 0.25g |
| DBCO-dT-CE Phosphoramidite | 10-1539-95 | 50 µmole |
| | 10-1539-90 | 100 µmole |
| | 10-1539-02 | 0.25g |
| DBCO-sulfo-NHS Ester (Dissolve 5.2mg in 60µL water or DMSO) | 50-1941-23 | 5.2mg |
| | 50-1941-24 | 52mg |
| DBCO-Serinol Phosphoramidite | 10-1998-95 | 50 µmole |
| | 10-1998-90 | 100 µmole |
| | 10-1998-02 | 0.25g |
| 3'-DBCO Serinol CPG | 20-2998-01 | 0.1g |
| | 20-2998-10 | 1.0g |
| | 0.2 µmole columns | Pack of 4 |
| | 1 µmole columns | Pack of 4 |
| | 10 µmole column (ABI) | Pack of 1 |
| | 15 µmole column (Expedite) | Pack of 1 |



DBCO-dT



5'-DBCO-TEG



DBCO-sulfo-NHS Ester

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

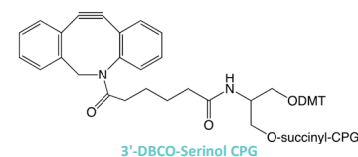
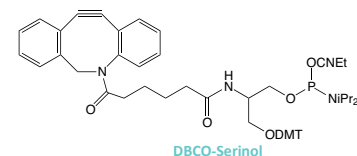
For Instrument type Add

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

RELATED

| | |
|-----------------------|-----|
| 0.5M CSO..... | 36 |
| Serinol Products..... | 102 |



CONJUGATION USING CLICK CHEMISTRY (CONT.)

REFERENCE

- (1) J. Gierlich, G.A. Burley, P.M. Gramlich, D.M. Hammond, and T. Carell, *Org Lett*, 2006, **8**, 3639-42.

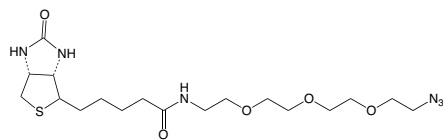
Glen Research is offering first our most popular labels for general interest and, subsequently, we will add azide products that are not compatible with phosphoramidite chemistry.

Biotin is still our most commonly used label and biotinTEG, with its hydrophilic triethylene glycol spacer, is the most popular biotin product. Desthiobiotin is a biotin analogue that is well captured by streptavidin but the captured product can be easily released by applying a biotin solution to the streptavidin beads. 6-FAM is our most popular fluorescein derivative and we offer azides of both 6-FAM and pivaloyl-protected 6-FAM for situations where subsequent reactions require the 6-FAM to be protected. In both 6-FAM products, the hydrophilic TEG spacer is again used. The azides are offered in 25 and 100 μ mole packs for convenient oligonucleotide labeling.

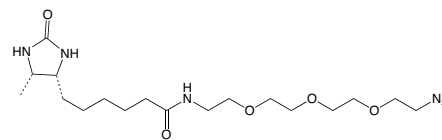
7-Hydroxycoumarin, also known as umbelliferone, is a highly fluorescent, pH-sensitive fluorophore that emits in the blue region of the spectrum. However, its fluorescence is strongly quenched if the hydroxyl is alkylated or phosphorylated, making it useful in high-throughput screening for phosphatases and lipases. Interestingly, it was found that the 3-azido derivative is also highly quenched but, upon reaction with an alkyne in the presence of copper to form the triazole, the fluorescence is restored.¹ The clicked coumarin emits at a lambda max of 480 nm and absorbs at 358 nm.

HEX and TET are two of our most popular fluorescein-based dyes for labeling oligonucleotides. We are happy to offer 6-HEX and 6-TET Azides for use in click conjugations.

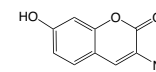
| Item | Catalog No. | Pack |
|----------------------------|-------------|----------------|
| BiotinTEG Azide | 50-2000-92 | 25 μ mole |
| | 50-2000-90 | 100 μ mole |
| DesthiobiotinTEG Azide | 50-2001-92 | 25 μ mole |
| | 50-2001-90 | 100 μ mole |
| Dipivaloyl 6-FAM-TEG Azide | 50-2002-92 | 25 μ mole |
| | 50-2002-90 | 100 μ mole |
| 6-FAM-TEG Azide | 50-2003-92 | 25 μ mole |
| | 50-2003-90 | 100 μ mole |
| Coumarin Azide | 50-2004-92 | 25 μ mole |
| | 50-2004-90 | 100 μ mole |
| 6-HEX Azide | 50-2005-92 | 25 μ mole |
| | 50-2005-90 | 100 μ mole |
| 6-TET Azide | 50-2006-92 | 25 μ mole |
| | 50-2006-90 | 100 μ mole |



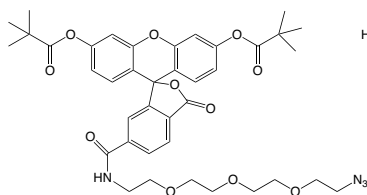
BiotinTEG Azide



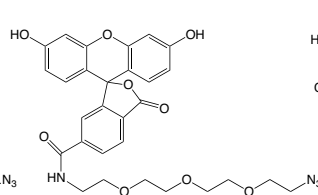
DesthiobiotinTEG Azide



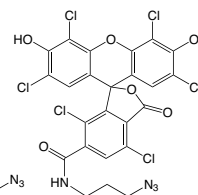
Coumarin Azide



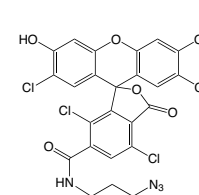
Dipivaloyl 6-FAM-TEG Azide



6-FAM-TEG Azide



6-HEX Azide



6-TET Azide

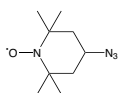
CONJUGATION USING CLICK CHEMISTRY (CONT.)

Two nitroxide spin labels, TEMPO Azide and TEMPO-TEG Azide, for site directed spin labeling (SDSL) are now offered.

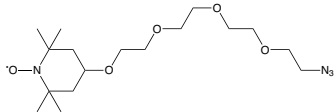
Click Chemistry with psoralen azide and one of our many nucleosidic and non-nucleosidic alkyne derivatives has the potential to generate a variety of practical cross-linkers. The well known reversible cross-linking behavior of psoralen with an adjacent thymidine residue could be very useful.

To better address applications in near-infrared (NIR) imaging, Glen Research is offering a water soluble Disulfo-Cyanine 7 azide that can be easily conjugated to DNA and RNA through standard click chemistry. This long wavelength dye offers the benefits of improved solubility, reduced aggregation, and improved stability in the near-infrared spectrum along with the convenience of click chemistry.

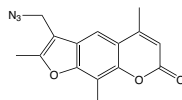
| Item | Catalog No. | Pack |
|-------------------------|-------------|----------------|
| TEMPO Azide | 50-2007-92 | 25 μ mole |
| | 50-2007-90 | 100 μ mole |
| TEMPO-TEG Azide | 50-2008 | Discontinued |
| Psoralen Azide | 50-2009-92 | 25 μ mole |
| | 50-2009-90 | 100 μ mole |
| Disulfo-Cyanine 7 Azide | 50-2010 | Discontinued |



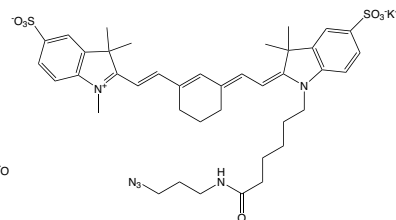
TEMPO Azide



TEMPO-TEG Azide



Psoralen Azide



Disulfo-Cyanine 7 Azide

SERINOL REAGENTS FOR MODIFICATION AND LABELING

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

INTELLECTUAL PROPERTY

Serinol Reagents for Modification and Labeling are covered by US Patent No.: 8,394,948.

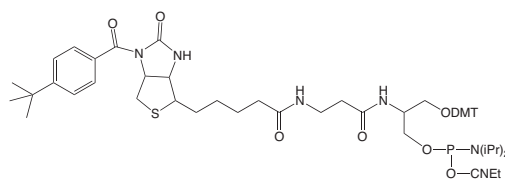
Most popular non-nucleosidic phosphoramidites for modification and labeling are based on two structural types: 1,2-diols and 1,3-diols. Products based on a 1,2-diol backbone were first described to allow amino-modification and biotin labeling. Technically, the 1,2-diol backbone has some drawbacks relative to the 1,3-diol backbone. The 1,2-diol backbone can participate in a dephosphorylation reaction since the 1,2-diol can form a favored 5-membered cyclic phosphate intermediate. This reaction is competitive with simple hydrolysis of the protecting groups and leads to some loss of label. However, the degree of loss at the 3' terminus can be limited by the removal of the cyanoethyl protecting group using DBU or diethylamine prior to the cleavage and deprotection steps. Similarly, loss at the 5' terminus can be eliminated by retaining the DMT group until the oligo is fully deprotected. Fortunately, the elimination reaction is virtually non-existent in the 1,3-diol backbone since the cyclic intermediate would be a 6-membered ring which is not favored for a cyclic phosphate intermediate.

IVD customers have requested a new backbone based on a 1,3-diol that would overcome any technical or IP issues surrounding our current products. We now offer a line of products based on the serinol backbone, which have been developed in close collaboration between Glen Research and Nelson Biotechnologies. Protected Biotin Serinol Phosphoramidite and CPG are protected with a *t*-butylbenzoyl group on the biotin ring. This group is designed to stop any phosphoramidite reactions at this active position in biotin. This protection avoids branching when using nucleophilic activators like DCI. The protecting group is easily removed during oligonucleotide cleavage and deprotection. The BiotinLC versions are similarly protected and should be useful for the synthesis of highly sensitive biotinylated probes. 6-Fluorescein Serinol Phosphoramidite and CPG are designed to prepare oligonucleotides containing one or several 6-Fluorescein (6-FAM) residues. Amino-Modifier Serinol Phosphoramidite and CPG are used to add amino groups into one or several positions in oligonucleotides. The amino group is protected with Fmoc, which may be removed on the synthesis column prior to solid-phase conjugation to the amino groups, or which may be removed during deprotection for subsequent solution phase conjugation to the amino groups.

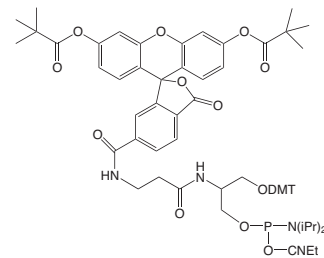
Combining lipoic acid and our patented serinol backbone, we now offer Dithiol Serinol Phosphoramidite and the related 3'-Dithiol Serinol CPG. This unique architecture moves the bulky dithiol away from the phosphate backbone, making it suitable for conjugation to gold surfaces. The long spacer arm of Dithiol Serinol also allows multiple consecutive incorporations of the modifier without the need for intermediate spacer phosphoramidite additions to achieve optimal stepwise coupling efficiency.

We offer three products for use in Click Chemistry based upon our 1,3-diol product portfolio with the serinol backbone - a phosphoramidite for adding an alkyne group at the 5' terminus or within the sequence, a synthesis support for labeling the 3' terminus of oligonucleotides with an alkyne group, and DBCO-Serinol phosphoramidite as a copper-free click reagent.

| Item | Catalog No. | Pack |
|--|-------------|----------------|
| Protected Biotin Serinol Phosphoramidite | 10-1993-95 | 50 μ mole |
| | 10-1993-90 | 100 μ mole |
| | 10-1993-02 | 0.25g |
| 6-Fluorescein Serinol Phosphoramidite | 10-1994-95 | 50 μ mole |
| | 10-1994-90 | 100 μ mole |
| | 10-1994-02 | 0.25g |



Protected Biotin Serinol Phosphoramidite

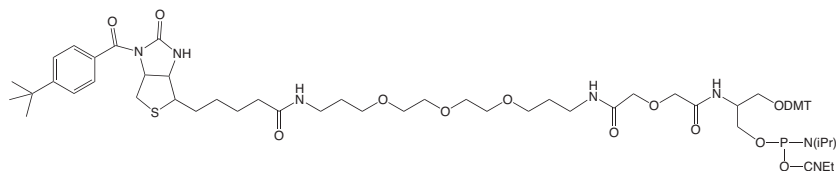


6-Fluorescein Serinol Phosphoramidite

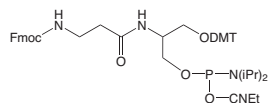
SERINOL REAGENTS FOR MODIFICATION AND LABELING (CONT.)

| Item | Catalog No. | Pack |
|--|-------------|----------------|
| Protected BiotinLC Serinol Phosphoramidite | 10-1995-95 | 50 μ mole |
| | 10-1995-90 | 100 μ mole |
| | 10-1995-02 | 0.25g |
| Amino-Modifier Serinol Phosphoramidite | 10-1997-95 | 50 μ mole |
| | 10-1997-90 | 100 μ mole |
| | 10-1997-02 | 0.25g |
| Dithiol Serinol Phosphoramidite | 10-1991-95 | 50 μ mole |
| | 10-1991-90 | 100 μ mole |
| | 10-1991-02 | 0.25g |
| Alkyne-Modifier Serinol Phosphoramidite | 10-1992-95 | 50 μ mole |
| | 10-1992-90 | 100 μ mole |
| | 10-1992-02 | 0.25g |
| DBCO-Serinol Phosphoramidite | 10-1998-95 | 50 μ mole |
| | 10-1998-90 | 100 μ mole |
| | 10-1998-02 | 0.25g |

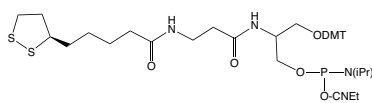
| RELATED |
|-------------|
| DBCO.....99 |



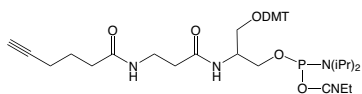
Protected BiotinLC Serinol Phosphoramidite



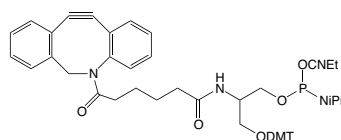
Amino-Modifier Serinol Phosphoramidite



Dithiol Serinol



Alkyne-Modifier Serinol Phosphoramidite



DBCO-Serinol

SERINOL REAGENTS FOR MODIFICATION AND LABELING (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

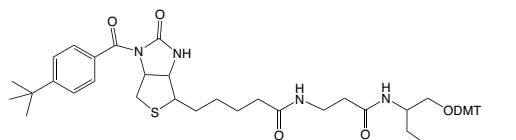
Columns

For Instrument type *Add*

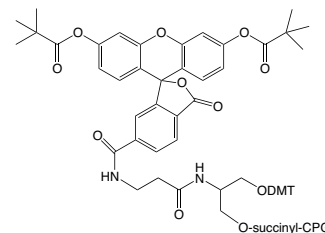
Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

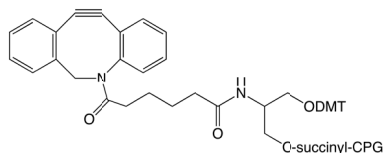
| Item | Catalog No. | Pack |
|---------------------------------|-----------------------|-----------|
| 3'-Protected Biotin Serinol CPG | 20-2993-01 | 0.1g |
| | 20-2993-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2993-14 | Pack of 1 |
| 3'-6-Fluorescein Serinol CPG | 20-2994-01 | 0.1g |
| | 20-2994-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2994-14 | Pack of 1 |
| 3'-Amino-Modifier Serinol CPG | 20-2997-01 | 0.1g |
| | 20-2997-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2997-14 | Pack of 1 |
| 3'-DBCO Serinol CPG | 20-2998-01 | 0.1g |
| | 20-2998-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2998-14 | Pack of 1 |
| 3'-Azido-Modifier Serinol CPG | 20-2999-01 | 0.1g |
| | 20-2999-10 | 1.0g |
| | 0.2 μmole columns | Pack of 4 |
| | 1 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | 20-2999-14 | Pack of 1 |



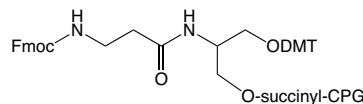
3'-Protected Biotin Serinol CPG



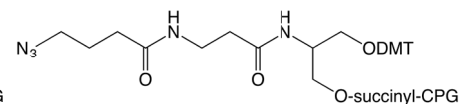
3'-6-Fluorescein Serinol CPG



3'-DBCO Serinol CPG



3'-Amino-Modifier Serinol CPG



3'-Azido-Modifier Serinol CPG

SERINOL REAGENTS FOR MODIFICATION AND LABELING (CONT.)

INTELLECTUAL PROPERTY

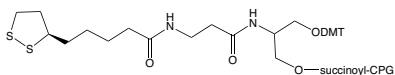
This product is covered under US Patent 8,945,515 B2.

| Item | Catalog No. | Pack |
|--------------------------------|-------------|-----------|
| 3'-Dithiol Serinol CPG | 20-2991-01 | 0.1g |
| | 20-2991-10 | 1.0g |
| 0.2 μmole columns | 20-2991-42 | Pack of 4 |
| 1 μmole columns | 20-2991-41 | Pack of 4 |
| 10 μmole column (ABI) | 20-2991-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2991-14 | Pack of 1 |
| 3'-Alkyne-Modifier Serinol CPG | 20-2992-01 | 0.1g |
| | 20-2992-10 | 1.0g |
| 0.2 μmole columns | 20-2992-42 | Pack of 4 |
| 1 μmole columns | 20-2992-41 | Pack of 4 |
| 10 μmole column (ABI) | 20-2992-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2992-14 | Pack of 1 |

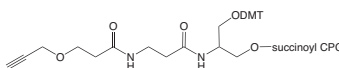
COT SERINOL PHOSPHoramidITE

COT Serinol Phosphoramidites has been discontinued. Please contact technical support.

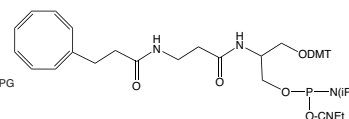
| Item | Catalog No. | Pack |
|-----------------------------|-------------|--------------|
| COT Serinol Phosphoramidite | 10-1996 | Discontinued |



3'-Dithiol Serinol CPG



3'-Alkyne-Modifier Serinol CPG



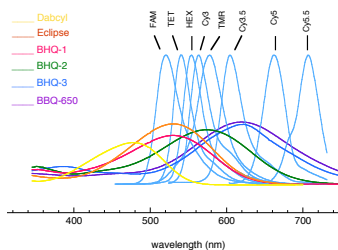
COT Serinol

DABCYL LABELING

REFERENCE

(1) S. Tyagi and F.R. Kramer, *Nature Biotechnology*, 1996, 4, 303-308.

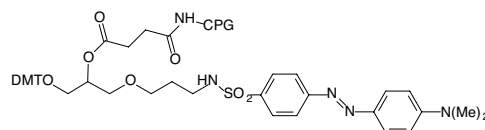
DYE QUENCHER PLOT



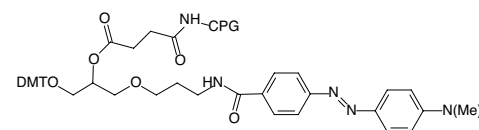
<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

A molecular beacon probe¹ has its natural fluorescence quenched in solution unless it is hybridized to the target sequence. Consequently, the design of a molecular beacon requires a fluorophore to be in one part of the sequence and the quencher molecule to be in another, with both molecules being separated from the oligonucleotide by a hydrocarbon spacer. The DabcyI group has been found to be a universal quencher. 3'-DabcyI CPG and 3'-DabcyI CPG are used to prepare probes with the quencher blocking the 3'-terminus. 5'-DabcyI Phosphoramidite locates the quencher at the 5'-terminus and DabcyI-dT places it within the sequence, leaving the 3'-terminus available for polymerase extension.

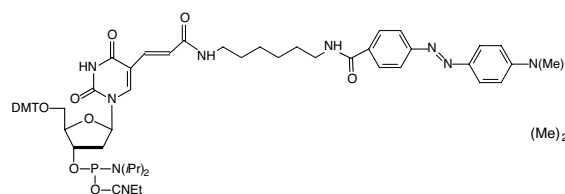
| Item | Catalog No. | Pack | |
|---------------------------------|------------------------------|----------------|------------|
| 3'-DabcyI CPG | 20-5911-01 | 0.1g | |
| | 20-5911-10 | 1.0g | |
| | 1 μ mole columns | 20-5911-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-5911-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-5911-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-5911-14 | Pack of 1 | |
| 3'-DabcyI CPG | 20-5912-01 | 0.1g | |
| | 20-5912-10 | 1.0g | |
| | 1 μ mole columns | 20-5912-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-5912-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-5912-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-5912-14 | Pack of 1 | |
| 3'-DabcyI PS | 26-5912-01 | 0.1g | |
| | 26-5912-10 | 1.0g | |
| | 200 nmole columns (ABI 3900) | 26-5912-52 | Pack of 10 |
| | 40 nmole columns (ABI 3900) | 26-5912-55 | Pack of 10 |
| DabcyI-dT | 10-1058-95 | 50 μ mole | |
| | 10-1058-90 | 100 μ mole | |
| | 10-1058-02 | 0.25g | |
| 5'-DabcyI Phosphoramidite | 10-5912-95 | 50 μ mole | |
| | 10-5912-90 | 100 μ mole | |
| | 10-5912-02 | 0.25g | |



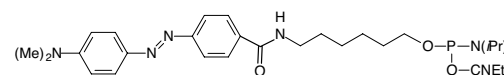
DabcyI CPG



DabcyI CPG



DabcyI-dT



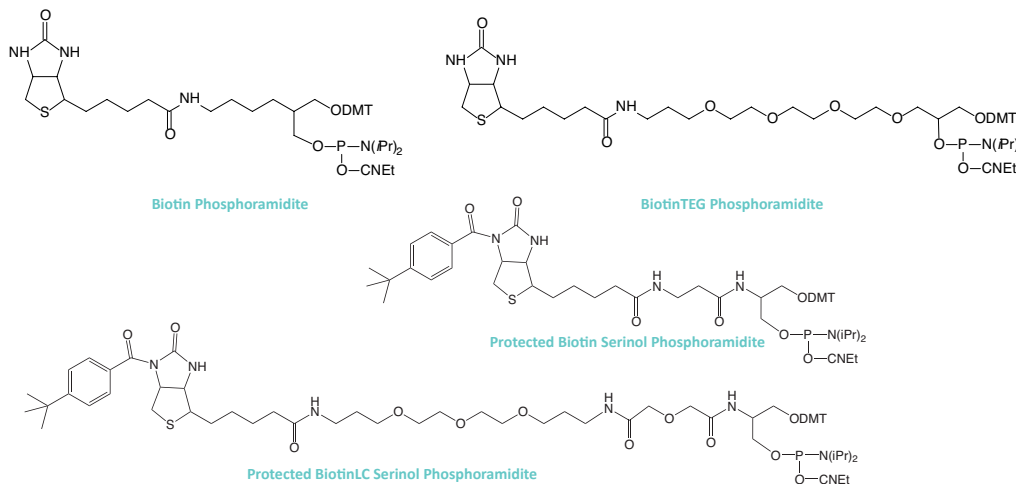
5'-DabcyI Phosphoramidite

BIOTIN LABELING

Glen Research biotin phosphoramidites for direct labeling of synthetic oligonucleotides exhibit the following features:

1. All are soluble in acetonitrile at concentrations useful for DNA synthesis.
2. All include a DMT group for cartridge purifications which is essential for the preparation of biotinylated PCR primers because of the potential for cross contamination in HPLC purifications.
3. For the development of diagnostic probes, biotin phosphoramidite is capable of branching to allow multiple biotins to be introduced at the 3' - or 5' -terminus. BiotinTEG Phosphoramidite contains a 15 atom mixed polarity spacer arm based on a triethylene glycol.
4. Protected Biotin Serinol Phosphoramidite and CPG are protected with a *t*-butylbenzoyl group on the biotin ring. This group is designed to stop any phosphoramidite reactions at this active position in biotin. This protection avoids branching when using nucleophilic activators like DCI. The protecting group is easily removed during oligonucleotide cleavage and deprotection. The BiotinLC versions are similarly protected and should be useful for the synthesis of highly sensitive biotinylated probes.

| Item | Catalog No. | Pack |
|--|-------------|----------------|
| Biotin Phosphoramidite | 10-1953-95 | 50 μ mole |
| | 10-1953-90 | 100 μ mole |
| | 10-1953-02 | 0.25g |
| BiotinTEG Phosphoramidite | 10-1955-95 | 50 μ mole |
| | 10-1955-90 | 100 μ mole |
| | 10-1955-02 | 0.25g |
| Protected Biotin Serinol Phosphoramidite | 10-1993-95 | 50 μ mole |
| | 10-1993-90 | 100 μ mole |
| | 10-1993-02 | 0.25g |
| Protected BiotinLC Serinol Phosphoramidite | 10-1995-95 | 50 μ mole |
| | 10-1995-90 | 100 μ mole |
| | 10-1995-02 | 0.25g |



OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

| | |
|----------------------------|------------|
| Monomers | |
| <i>For Instrument type</i> | <i>Add</i> |
| Expedite | E |
| MerMade | M |
| Columns | |
| <i>For Instrument type</i> | <i>Add</i> |
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

BIOTIN LABELING (CONT.)

RELATED

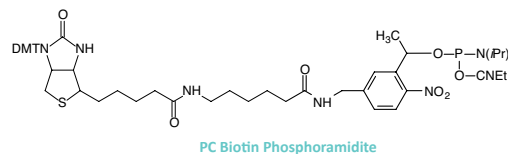
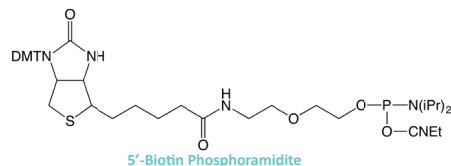
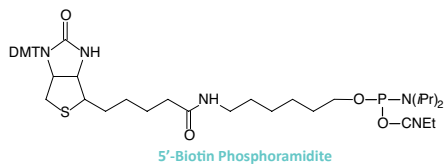
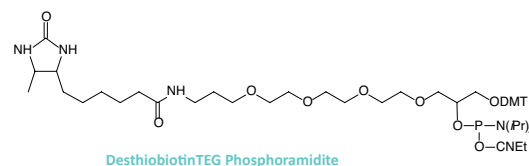
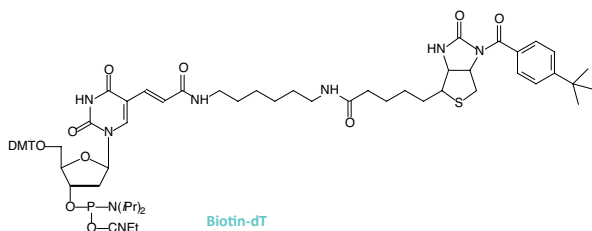
PC Biotin 94

Biotin-dT can replace dT residues within the oligonucleotide sequence. 5'-Biotin phosphoramidite can be added ONLY ONCE to the 5'-terminus of an oligonucleotide. However, the DMT group on the biotin can be used in RP cartridge and HPLC purification techniques. PC Biotin is a photocleavable 5'-biotin phosphoramidite. BiotinTEG CPG and Protected BiotinLC Serinol CPG are designed for the direct synthesis of oligonucleotides containing biotin at the 3' terminus.

Desthiobiotin is a biotin analogue that exhibits lower binding to biotin-binding proteins such as streptavidin. This biotin analogue is lacking the sulfur group from the molecule and has a dissociation constant (Kd) several orders of magnitude less than biotin/streptavidin. As a result, biomolecules containing desthiobiotin are dissociated from streptavidin simply in the presence of buffered solutions of biotin. We offer desthiobiotinTEG phosphoramidite and the corresponding CPG.

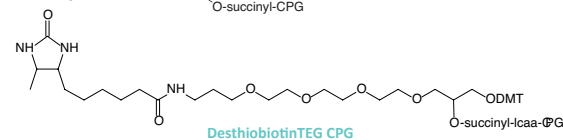
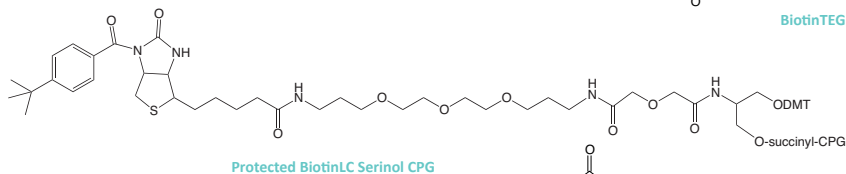
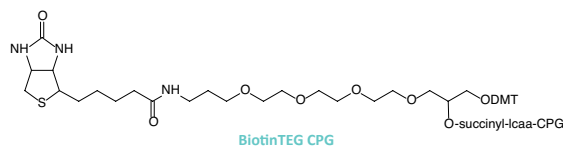
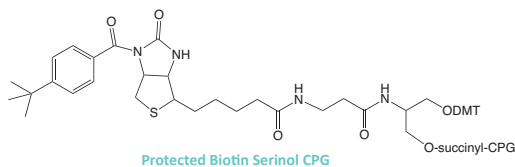
ABI-style vials and columns are supplied unless otherwise requested (see note box).

| Item | Catalog No. | Pack |
|----------------------------------|-------------|----------------|
| 5'-Biotin Phosphoramidite | 10-5950-95 | 50 μ mole |
| | 10-5950-90 | 100 μ mole |
| | 10-5950-02 | 0.25g |
| 5'-Biotin II Phosphoramidite | 10-1954-95 | 50 μ mole |
| | 10-1954-90 | 100 μ mole |
| | 10-1954-02 | 0.25g |
| Biotin-dT | 10-1038-95 | 50 μ mole |
| | 10-1038-90 | 100 μ mole |
| | 10-1038-02 | 0.25g |
| PC Biotin Phosphoramidite | 10-4950-95 | 50 μ mole |
| | 10-4950-90 | 100 μ mole |
| | 10-4950-02 | 0.25g |
| DesthiobiotinTEG Phosphoramidite | 10-1952-95 | 50 μ mole |
| | 10-1952-90 | 100 μ mole |
| | 10-1952-02 | 0.25g |



BIOTIN LABELING (CONT.)

| Item | Catalog No. | Pack |
|-----------------------------------|-------------|------------|
| 3'-BiotinTEG CPG | 20-2955-01 | 0.1g |
| | 20-2955-10 | 1.0g |
| 0.2 μmole columns | 20-2955-42 | Pack of 4 |
| 1 μmole columns | 20-2955-41 | Pack of 4 |
| 10 μmole column (ABI) | 20-2955-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2955-14 | Pack of 1 |
| 3'-BiotinTEG PS | 26-2955-01 | 0.1g |
| | 26-2955-10 | 1.0g |
| 200 nmole columns (ABI 3900) | 26-2955-52 | Pack of 10 |
| 40 nmole columns (ABI 3900) | 26-2955-55 | Pack of 10 |
| 3'-Protected Biotin Serinol CPG | 20-2993-01 | 0.1g |
| | 20-2993-10 | 1.0g |
| 0.2 μmole columns | 20-2993-42 | Pack of 4 |
| 1 μmole columns | 20-2993-41 | Pack of 4 |
| 10 μmole column (ABI) | 20-2993-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2993-14 | Pack of 1 |
| 3'-Protected BiotinLC Serinol CPG | 20-2995-01 | 0.1g |
| | 20-2995-10 | 1.0g |
| 0.2 μmole columns | 20-2995-42 | Pack of 4 |
| 1 μmole columns | 20-2995-41 | Pack of 4 |
| 10 μmole column (ABI) | 20-2995-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2995-14 | Pack of 1 |
| DesthiobiotinTEG CPG | 20-2952-01 | 0.1g |
| | 20-2952-10 | 1.0g |
| 0.2 μmole columns | 20-2952-42 | Pack of 4 |
| 1 μmole columns | 20-2952-41 | Pack of 4 |
| 10 μmole column (ABI) | 20-2952-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2952-14 | Pack of 1 |



OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

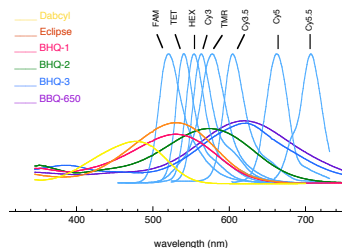
For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

FLUORESCIN LABELING

DYE QUENCHER PLOT



<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

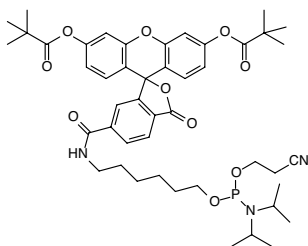
5'-Fluorescein phosphoramidite contains no 4,4'-dimethoxytrityl (DMT) group and can be added only once at the 5'-terminus, thereby terminating synthesis. This product is prepared using the 6-carboxyfluorescein derivative. The tetrachloro-, hexachloro- and dichloro-dimethoxy-fluorescein (TET, HEX and JOE, respectively) phosphoramidites are designed to take advantage of the multicolor detection capability of modern DNA sequencers and genetic analyzers. Fluorescein phosphoramidite is designed to produce the same fluorescein-type structure as had been previously prepared using fluorescein isothiocyanate (FITC). Our fluorescein phosphoramidite also contains a DMT group to allow quantification of coupling. The analogous structure, 6-Fluorescein Phosphoramidite, prepared using 6-FAM, is also available, along with 6-Fluorescein Serinol Phosphoramidite. Fluorescein-dT and JOE-dT can be inserted into the desired sequence as a replacement for a dT residue.

We offer five fluorescein supports. Fluorescein CPG has traditionally been used to add the fluorescein label at the 3'-terminus. The analogous structure, 3'-(6-Fluorescein) CPG, prepared using 6-FAM, is now also available, along with 6-Fluorescein Serinol CPG. We also offer 3'-(6-FAM) CPG and Fluorescein-dT CPG, both derivatives of 6-carboxyfluorescein (6-FAM). Both are single isomers and use an amide linkage which is stable during cleavage and deprotection and does not allow isomer formation. 3'-(6-FAM) CPG allows effective blockage of the 3'-terminus from polymerase extension as well as exonuclease digestion. Fluorescein-dT CPG allows both of these enzymatic activities to proceed. Normal cleavage and deprotection with ammonium hydroxide readily generates the fluorescein labeled oligos.

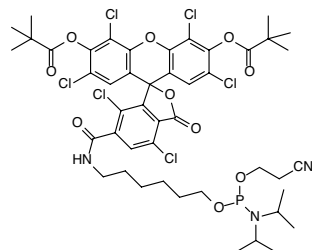
The NHS ester provides the option for post-deprotection labeling. When paired with a 5'-amino-modifier C6 (10-1906, 10-1907, 10-1916 or 10-1947), the resulting product would be identical to that generated with 5'-Fluorescein Phosphoramidite (10-5901).

The spectral characteristics of these dyes are detailed on the following page.

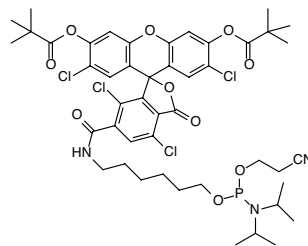
| Item | Cat. No. | Pack |
|--|------------|----------------|
| 5'-Fluorescein Phosphoramidite (6-FAM) | 10-5901-95 | 50 μ mole |
| | 10-5901-90 | 100 μ mole |
| | 10-5901-02 | 0.25g |
| 5'-Hexachloro-Fluorescein Phosphoramidite (HEX) | 10-5902-95 | 50 μ mole |
| | 10-5902-90 | 100 μ mole |
| | 10-5902-02 | 0.25g |
| 5'-Tetrachloro-Fluorescein Phosphoramidite (TET) | 10-5903-95 | 50 μ mole |
| | 10-5903-90 | 100 μ mole |
| | 10-5903-02 | 0.25g |



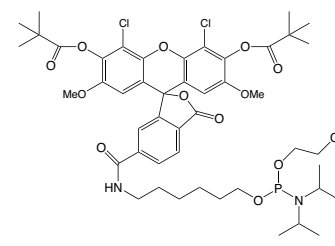
5'-Fluorescein Phosphoramidite



5'-Hexachloro-Fluorescein
Phosphoramidite



5'-Tetrachloro-Fluorescein
Phosphoramidite



5'-Dichloro-dimethoxy-Fluorescein
Phosphoramidite II

FLUORESCIN LABELING (CONT.)

| Item | Cat. No. | Pack |
|--|------------|----------------|
| 5'-Dichloro-dimethoxy-Fluorescein Phosphoramidite II (JOE) | 10-5906-95 | 50 μ mole |
| | 10-5906-90 | 100 μ mole |
| | 10-5906-02 | 0.25g |
| JOE-dT Phosphoramidite | 10-5936-95 | 50 μ mole |
| | 10-5936-90 | 100 μ mole |
| | 10-5936-02 | 0.25g |
| Fluorescein Phosphoramidite | 10-1963-95 | 50 μ mole |
| | 10-1963-90 | 100 μ mole |
| | 10-1963-02 | 0.25g |
| 6-Fluorescein Phosphoramidite | 10-1964-95 | 50 μ mole |
| | 10-1964-90 | 100 μ mole |
| | 10-1964-02 | 0.25g |
| 6-Fluorescein Serinol Phosphoramidite | 10-1994-95 | 50 μ mole |
| | 10-1994-90 | 100 μ mole |
| | 10-1994-02 | 0.25g |
| Fluorescein-dT Phosphoramidite | 10-1056-95 | 50 μ mole |
| | 10-1056-90 | 100 μ mole |
| | 10-1056-02 | 0.25g |
| Fluorescein NHS ester | 50-5901-22 | 2.4mg |

FLUORESCENT DYES

| | Absorbance Maximum | Emission Maximum | Color |
|--------------------------------|--------------------|------------------|-------------|
| Fluorescein | 494nm | 525nm | Green |
| Tetrachloro-Fluorescein | 521nm | 536nm | Orange |
| Hexachloro-Fluorescein | 535nm | 556nm | Pink |
| SIMA (HEX) | 538nm | 551nm | Pink |
| Dichloro-dimethoxy-Fluorescein | 525nm | 548nm | Orange/Pink |
| TAMRA | 565nm | 580nm | Rose |
| Cy3 | 546nm | 563nm | Red |
| Cy3.5 | 588nm | 604nm | Purple |
| Cy5 | 646nm | 662nm | Violet |
| Cy5.5 | 683nm | 707nm | Dark Blue |
| Yakima Yellow | 530nm | 549nm | Yellow |
| Redmond Red | 579nm | 595nm | Red |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

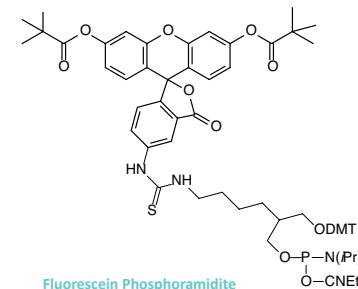
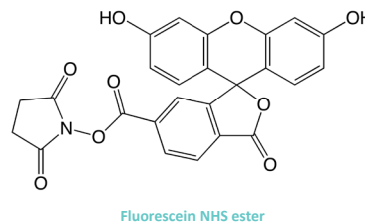
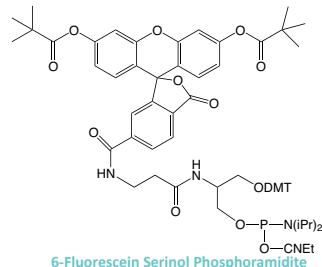
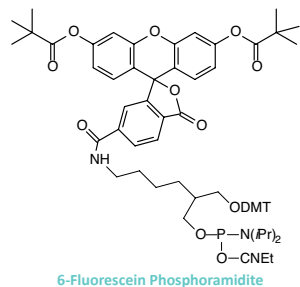
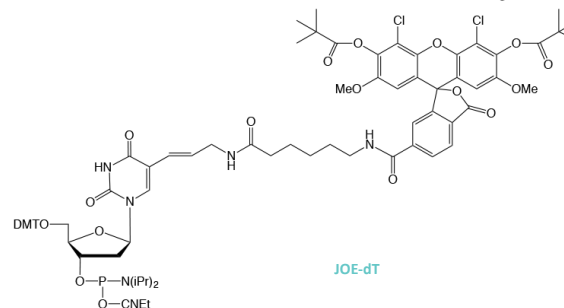
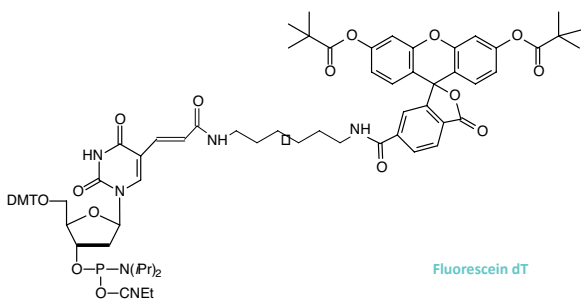
| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

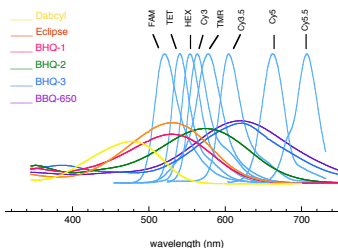
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)



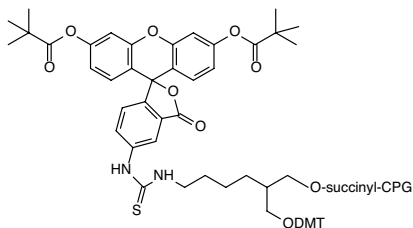
FLUORESCIN LABELING (CONT.)

DYE QUENCHER PLOT

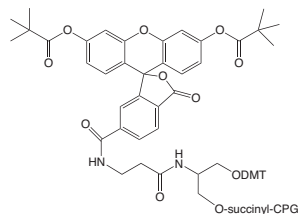


<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

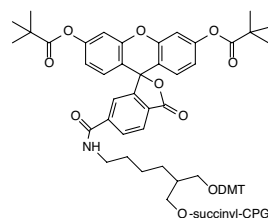
| Item | Cat. No. | Pack |
|---------------------------------|------------|--------------|
| 3'-Fluorescein CPG | 20-2963-01 | 0.1g |
| | 20-2963-10 | 1.0g |
| 1 μ mole columns | 20-2963-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2963-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-2963-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2963-14 | Pack of 1 |
| 3'-(6-Fluorescein) CPG | 20-2964-01 | 0.1g |
| | 20-2964-10 | 1.0g |
| 1 μ mole columns | 20-2964-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2964-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-2964-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2964-14 | Pack of 1 |
| 3'-(6-FAM) CPG | 20-2961-01 | 0.1g |
| | 20-2961-10 | 1.0g |
| 1 μ mole columns | 20-2961-41 | Pack of 4 |
| 0.2 μ mole columns | 20-2961-42 | Pack of 4 |
| 10 μ mole column (ABI) | 20-2961-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-2961-14 | Pack of 1 |
| 3'-(6-FAM) PS | 26-2961-01 | 0.1g |
| | 26-2961-10 | 1.0g |
| 200 nmole columns (ABI 3900) | 26-2961-52 | Pack of 10 |
| 40 nmole columns (ABI 3900) | 26-2961-55 | Pack of 10 |
| 3'-6-Fluorescein Serinol CPG | 20-2994 | Discontinued |



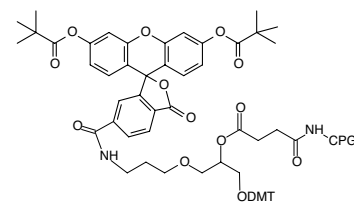
3'-Fluorescein CPG



3'-6-Fluorescein Serinol CPG



3'-(6-Fluorescein) CPG



3'-(6-FAM) CPG

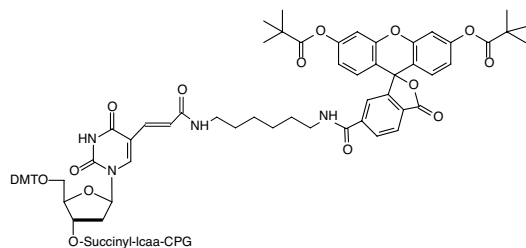
FLUORESC EIN LABELING (CONT.)

| Item | Cat. No. | Pack |
|----------------------------|------------|-----------|
| 3'-Fluorescein-dT CPG | 20-2056-01 | 0.1g |
| | 20-2056-10 | 1.0g |
| 1 μmole columns | 20-2056-41 | Pack of 4 |
| 0.2 μmole columns | 20-2056-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-2056-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-2056-14 | Pack of 1 |

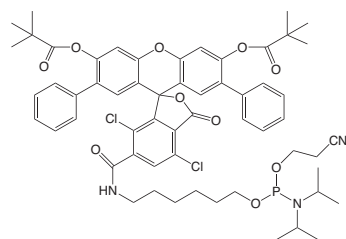
FLUORESC EIN LABELING (SIMA)

Dichloro-diphenyl-fluorescein, SIMA (HEX) exhibits virtually identical absorbance and emission spectra to HEX. SIMA (HEX) is much more stable to basic deprotection conditions than HEX and oligonucleotides can be deprotected using ammonium hydroxide at elevated temperatures and even ammonium hydroxide/methylamine (AMA) at room temperature or 65°C for 10 minutes. SIMA absorption maximum was 3 nm blue-shifted compared to HEX at pH 7. The absorbance is broader, so the extinction coefficient is smaller than that of HEX, but when exciting at 500 nm where the absorbance was normalized, the emission was still 90% of HEX and the emission was red-shifted by 5 nm. A second SIMA (HEX) product, SIMA (HEX)-dT, can be used to introduce SIMA (HEX) in the synthetic oligonucleotide sequence, usually as a replacement for the native dT linkage. Again, this product is fully compatible with deprotection schemes using ammonium hydroxide at elevated temperatures or AMA at room temperature and 65°C.

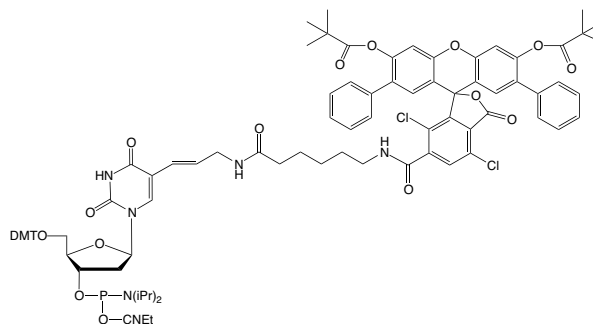
| Item | Cat. No. | Pack |
|-------------------------------|------------|-----------|
| SIMA (HEX) Phosphoramidite | 10-5905-95 | 50 μmole |
| | 10-5905-90 | 100 μmole |
| | 10-5905-02 | 0.25g |
| SIMA (HEX)-dT Phosphoramidite | 10-5945-95 | 50 μmole |
| | 10-5945-90 | 100 μmole |
| | 10-5945-02 | 0.25g |



3'-Fluorescein-dT CPG



SIMA (HEX) Phosphoramidite



SIMA (HEX)-dT Phosphoramidite

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

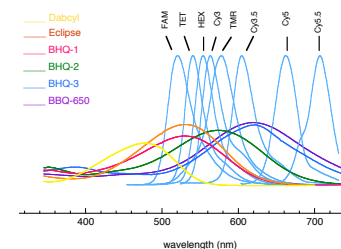
Columns

For Instrument type Add

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

DYE QUENCHER PLOT



<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

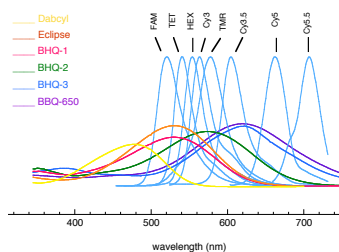
CYANINE LABELING

SPECTRAL DATA FOR CYANINE DYES

| | Absorbance Maximum | Emission Maximum | Color |
|-------------|--------------------|------------------|------------|
| Cyanine 3 | 546nm | 563nm | Red |
| Cyanine 3.5 | 588nm | 604nm | Purple |
| Cyanine 5 | 646nm | 662nm | Violet |
| Cyanine 5.5 | 683nm | 707nm | Dark Blue |
| Cyanine 7 | 750nm | 773nm | Dark Green |

(Measured in an oligo in 0.1M TEAA buffer, pH7.)

DYE QUENCHER PLOT



<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

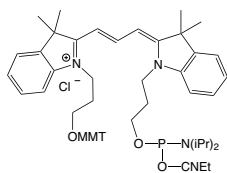
Two cyanine derivatives, Cyanine 3 and Cyanine 5, which differ in structure simply by the number of carbons in the conjugated polyene linkage, are joined by the closely related analogues, Cyanine 3.5 and Cyanine 5.5, and are available as phosphoramidites. Cyanine dyes are normally added once at the 5'-terminus and the MMT group should be removed on the synthesizer. The absorbance of the MMT cation (yellow) is noticeably different from the DMT cation (orange), and so, absorbance-based trityl monitors will detect it incorrectly as a low coupling. On the other hand, conductivity detectors will interpret the release more correctly. Cyanine dye phosphoramidites have also been used successfully adjacent to the 3'-terminus. Cyanine 3 and Cyanine 5 supports are also offered to allow simpler production of 3' cyanine dye-labeled oligonucleotides.

Deprotection of oligos containing Cyanine dyes may be carried out with ammonium hydroxide at room temperature, regardless of the base protecting groups on the monomers used. If there is a need to use ammonium hydroxide at elevated temperature, Cyanine 3 and Cyanine 3.5 are more stable than Cyanine 5 and Cyanine 5.5. However, it is always prudent to use monomers with base labile protecting groups to limit the exposure time to 2 hours or less at 65°C during deprotection.

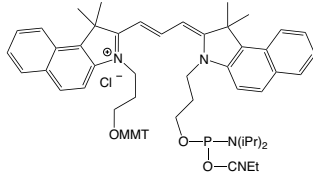
To better address applications in near-infrared (NIR) imaging, Glen Research is offering a water soluble Disulfo-Cyanine 7 azide that can be easily conjugated to DNA and RNA through standard click chemistry. This long wavelength dye offers the benefits of improved solubility, reduced aggregation, and improved stability in the near-infrared spectrum along with the convenience of click chemistry.

This NHS ester versions allows for post-deprotection labeling, and unlike the phosphoramidite versions, contains 2 sulfonate substitutions directly on the indocyanine nuclei. The sulfonates make the Cyanine 3 and 5 less susceptible to aggregation and do not significantly change the fluorescent properties of the dyes.

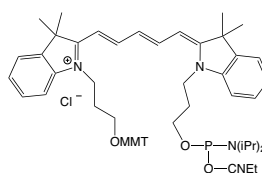
| Item | Cat. No. | Pack |
|-----------------------------|------------|-----------|
| Cyanine 3 Phosphoramidite | 10-5913-95 | 50 µmole |
| | 10-5913-90 | 100 µmole |
| | 10-5913-02 | 0.25g |
| Cyanine 3.5 Phosphoramidite | 10-5914-95 | 50 µmole |
| | 10-5914-90 | 100 µmole |
| | 10-5914-02 | 0.25g |
| Cyanine 5 Phosphoramidite | 10-5915-95 | 50 µmole |
| | 10-5915-90 | 100 µmole |
| | 10-5915-02 | 0.25g |
| Cyanine 5.5 Phosphoramidite | 10-5916-95 | 50 µmole |
| | 10-5916-90 | 100 µmole |
| | 10-5916-02 | 0.25g |



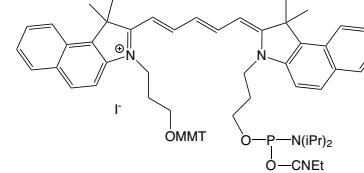
Cyanine 3 Phosphoramidite



Cyanine 3.5 Phosphoramidite



Cyanine 5 Phosphoramidite



Cyanine 5.5 Phosphoramidite

CYANINE LABELING (CONT.)

| Item | Cat. No. | Pack |
|--------------------------------|-------------------------------------|-----------|
| Quasar® 570-dT Phosphoramidite | 10-5953-95 | 50 µmole |
| | 10-5953-90 | 100 µmole |
| | 10-5953-02 | 0.25g |
| Quasar® 670-dT Phosphoramidite | 10-5955-95 | 50 µmole |
| | 10-5955-90 | 100 µmole |
| | 10-5955-02 | 0.25g |
| Cyanine 3 CPG | 20-5913-01 | 0.1g |
| | 20-5913-10 | 1.0g |
| | 1 µmole columns (TWIST format only) | Pack of 4 |
| | 0.2 µmole columns | Pack of 4 |
| Cyanine 5 CPG | 20-5915-01 | 0.1g |
| | 20-5915-10 | 1.0g |
| | 1 µmole columns (TWIST format only) | Pack of 4 |
| | 0.2 µmole columns | Pack of 4 |
| Disulfo-Cyanine 7 Azide | 50-2010-92 | 25 µmole |
| | 50-2010-90 | 100 µmole |
| sulfoCyanine 3 NHS Ester | 50-5913-22 | 3.8mg |
| sulfoCyanine 5 NHS Ester | 50-5915-22 | 3.9mg |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

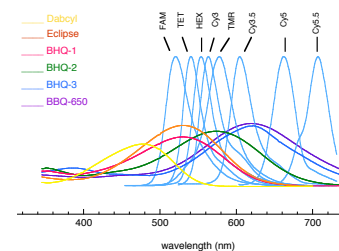
Columns

For Instrument type Add

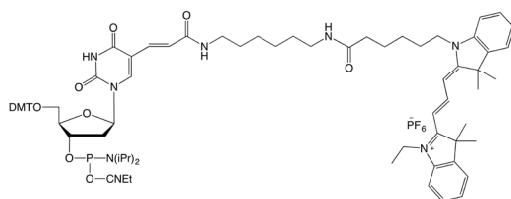
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

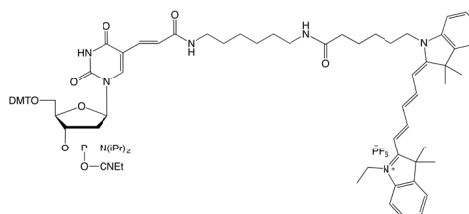
DYE QUENCHER PLOT



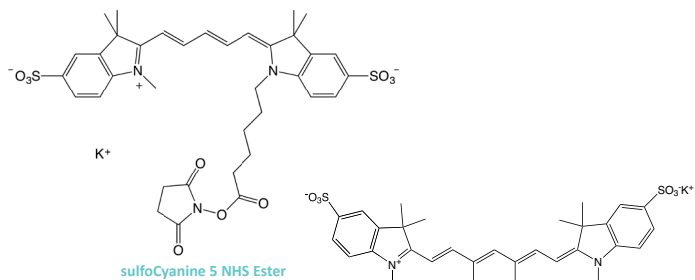
<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>



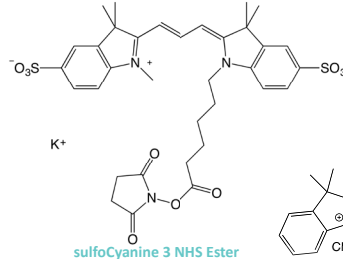
Quasar® 570-dT Phosphoramidite



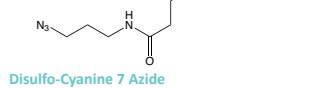
Quasar® 670-dT Phosphoramidite



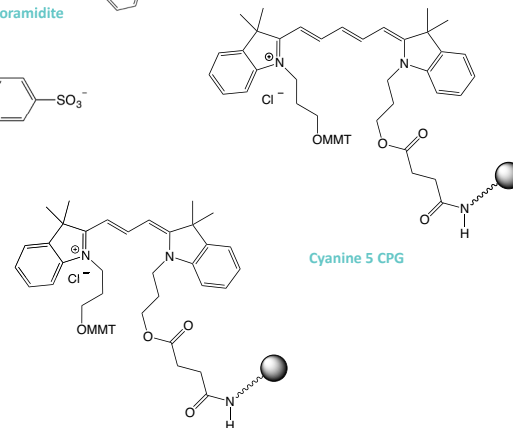
sulfoCyanine 5 NHS Ester



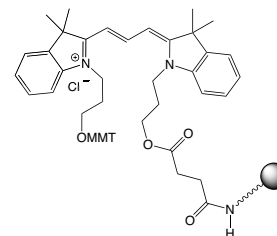
sulfoCyanine 3 NHS Ester



Disulfo-Cyanine 7 Azide



Cyanine 5 CPG



Cyanine 3 CPG

ELITTECHGROUP DYES AND QUENCHER

FLUORESCENT DYES

| | Absorbance Maximum | Emission Maximum | Color |
|----------------|--------------------|------------------|--------|
| Yakima Yellow | 530nm | 549nm | Yellow |
| Redmond Red | 579nm | 595nm | Red |
| AquaPhluor 593 | 593nm | 613nm | Red |

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A simple agreement must be signed before end-users and custom oligo services may purchase these products for use as defined above. https://www.glenresearch.com/media/productattach/import/technical_note/ELITechGroupProducts.pdf

AquaPhluor®, Yakima Yellow®, Redmond Red® and Eclipse® are registered Trademarks of ELITechGroup.

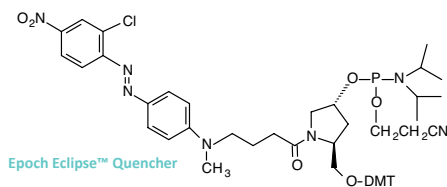
Glen Research's agreement with ELITechGroup, formerly Epoch Biosciences, allows us to offer several of their proprietary products designed for the synthesis of novel DNA probes. We are pleased to offer products based on ELITechGroup's Redmond Red®, Yakima Yellow® and AquaPhluor® 593 fluorophores and Eclipse® non-fluorescent quencher. Under our agreement we also supply PPG, a modified nucleoside, and 5'-Aldehyde-Modifier C2 Phosphoramidite. The fluorescent dyes, Yakima Yellow, Redmond Red and AquaPhluor 593, are available as phosphoramidites and supports. Yakima Yellow has an absorbance maximum at 530 nm and emission maximum at 549 nm, Redmond Red's absorbance and emission maxima are at 579 nm and 595 nm, respectively, and AquaPhluor 593 has an absorbance maximum at 593 nm and emission maximum at 613 nm.

The Eclipse quencher from ELITechGroup solves most of the problems inherent in the synthesis of molecular beacon and FRET probes. The Eclipse molecule is highly stable and can be used safely in all common oligo deprotection schemes. The absorbance maximum for Eclipse Quencher is at 522 nm, compared to 479 nm for dabcyI. In addition, the structure of the Eclipse Quencher is substantially more electron deficient than that of dabcyI and this leads to better quenching over a wider range of dyes, especially those with emission maxima at longer wavelengths (red shifted) such as Redmond Red and Cyanine 5. In addition, with an absorption range from 390 nm to 625 nm, the Eclipse Quencher is capable of effective performance in a wide range of colored FRET probes.

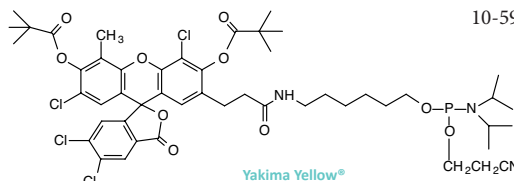
| Item | Cat. No. | Pack |
|------------------------------------|------------|-----------|
| Redmond Red® Phosphoramidite | 10-5920-95 | 50 µmole |
| | 10-5920-90 | 100 µmole |
| | 10-5920-02 | 0.25g |
| Yakima Yellow® Phosphoramidite | 10-5921-95 | 50 µmole |
| | 10-5921-90 | 100 µmole |
| | 10-5921-02 | 0.25g |
| 5'-AquaPhluor® 593 Phosphoramidite | 10-5923-95 | 50 µmole |
| | 10-5923-90 | 100 µmole |
| | 10-5923-02 | 0.25g |
| 5'-AquaPhluor® 639 Phosphoramidite | 10-5926-95 | 50 µmole |
| | 10-5926-90 | 100 µmole |
| | 10-5926-02 | 0.25g |

Eclipse® Quencher Phosphoramidite

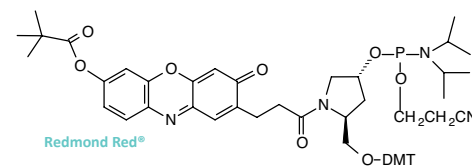
| | |
|------------|-----------|
| 10-5925-95 | 50 µmole |
| 10-5925-90 | 100 µmole |
| 10-5925-02 | 0.25g |



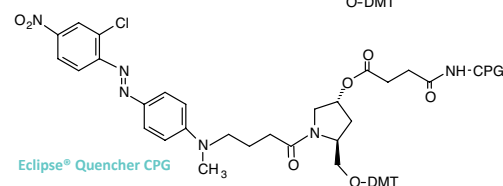
Epoch Eclipse™ Quencher



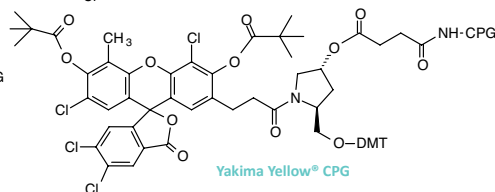
Yakima Yellow®



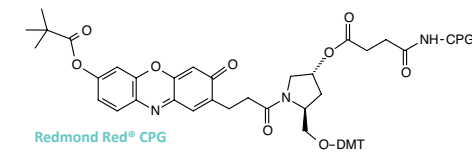
Redmond Red®



Eclipse® Quencher CPG



Yakima Yellow® CPG



Redmond Red® CPG

ELITECHGROUP DYES AND QUENCHER (CONT.)

| Item | Cat. No. | Pack |
|----------------------------|------------|-----------|
| Redmond Red® CPG | 20-5920-01 | 0.1g |
| | 20-5920-10 | 1.0g |
| 1 μmole columns | 20-5920-41 | Pack of 4 |
| 0.2 μmole columns | 20-5920-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5920-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5920-14 | Pack of 1 |
| Yakima Yellow® CPG | 20-5921-01 | 0.1g |
| | 20-5921-10 | 1.0g |
| 1 μmole columns | 20-5921-41 | Pack of 4 |
| 0.2 μmole columns | 20-5921-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5921-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5921-14 | Pack of 1 |
| AquaPhluor® 593 CPG | 20-5923-01 | 0.1g |
| | 20-5923-10 | 1.0g |
| 1 μmole columns | 20-5923-41 | Pack of 4 |
| 0.2 μmole columns | 20-5923-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5923-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5923-14 | Pack of 1 |
| AquaPhluor® 639 CPG | 20-5926-01 | 0.1g |
| | 20-5926-10 | 1.0g |
| 1 μmole columns | 20-5926-41 | Pack of 4 |
| 0.2 μmole columns | 20-5926-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5926-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5926-14 | Pack of 1 |
| Eclipse® Quencher CPG | 20-5925-01 | 0.1g |
| | 20-5925-10 | 1.0g |
| 1 μmole columns | 20-5925-41 | Pack of 4 |
| 0.2 μmole columns | 20-5925-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5925-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5925-14 | Pack of 1 |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

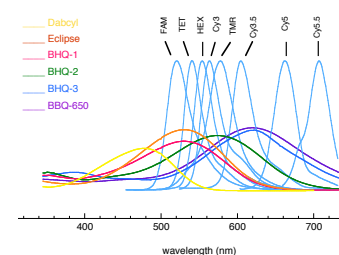
Columns

For Instrument type Add

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

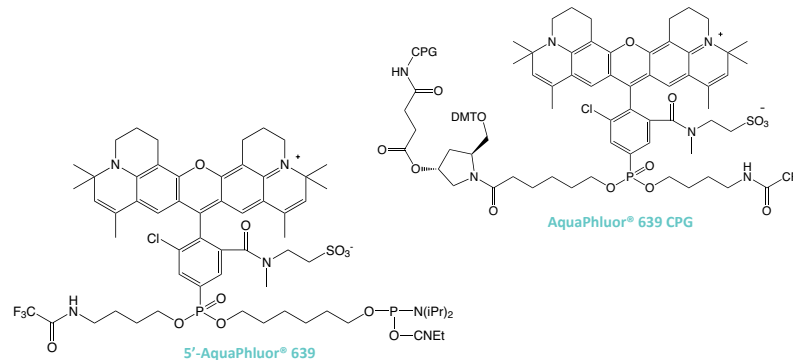
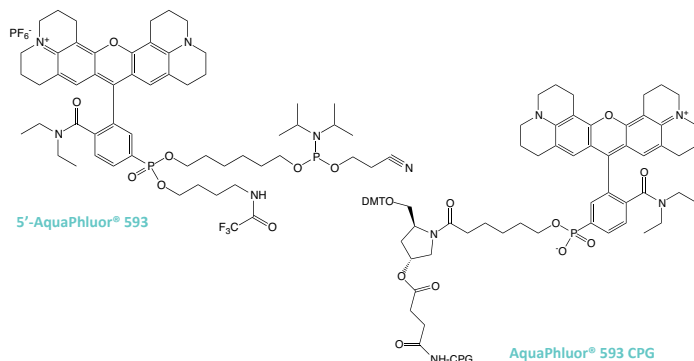
DYE QUENCHER PLOT



<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

RELATED

| | |
|------------------------------|----|
| PPG..... | 63 |
| 5'-Aldehyde-Modifier C2..... | 91 |



BLACK HOLE QUENCHER DYES

TABLE 1: BLACK HOLE QUENCHERS

| Quencher | λ_{max} (nm) | E260 (L/mol.cm) | E _{max} (L/mol.cm) |
|----------|-------------------------|--------------------|--------------------------------|
| BHQ-1 | 534 | 8,000 | 34,000 |
| BHQ-2 | 579 | 8,000 | 38,000 |
| BHQ-3 | 672 | 13,000 | 42,700 |

REFERENCES

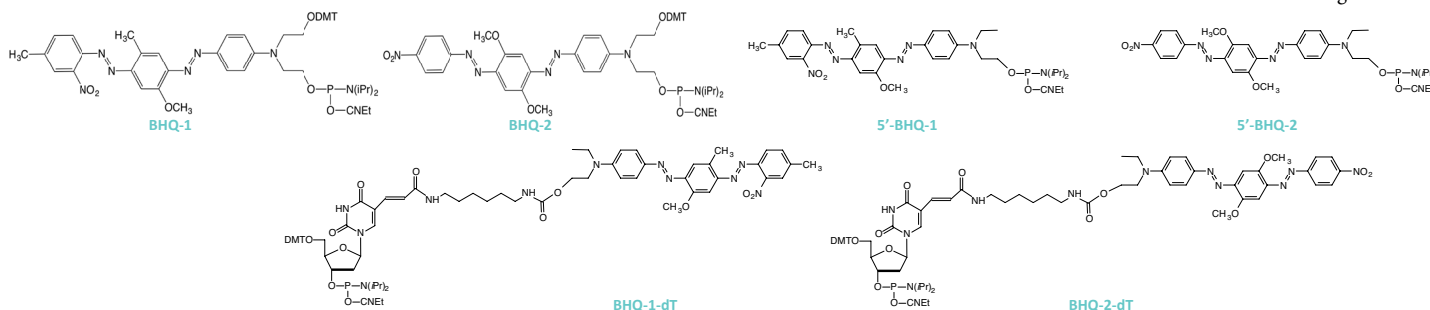
- (1) S.A.E. Marras, E.R. Kramer, and S. Tyagi, *Nucleic Acids Res.*, 2002, **30**, E122.
- (2) M.K. Johansson, H. Fidder, D. Dick, and R.M. Cook, *J Am Chem Soc*, 2002, **124**, 6950-6956.

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With the growing popularity of red and near-infrared dyes, we are offering the Black Hole Quencher™ dyes (BHQs), whose physical properties are detailed in Table 1. BHQ dyes are robust dark quenchers that very nicely complement our existing product line. They are compatible with ammonium hydroxide deprotection, exhibit excellent coupling efficiencies, have large extinction coefficients and are completely non-fluorescent. Their absorbances are well-tuned to quench a variety of popular fluorophores – even those far into the red, such as Cy3 and Cy5. The dark quencher most typically used in a Molecular Beacon is Dabcyl. Because the quenching does not involve FRET, there is little, if any, dependence upon donor-acceptor spectral overlap. In a comprehensive paper by Marras, Kramer and Tyagi,¹ the ability of BHQ-1 and BHQ-2 to quench 22 different fluorophores was evaluated. For shorter wavelength fluorophores such as fluorescein, the quenching efficiency was roughly the same as Dabcyl (91% – 93%). However, for dyes emitting in the far red, such as Cy5, the BHQ dyes were far superior – quenching the Cy5 with 96% efficiency, compared to 84% with Dabcyl. This may reflect the BHQ's ability to form stable, non-fluorescent complexes which can be a plus even in FRET probes. Indeed, recent work suggests that these non-fluorescent complexes will form even in the absence of a hairpin stem structure used by Molecular Beacons.²

| Item | Cat. No. | Pack |
|--------------------------|------------|----------------|
| BHQ-1 Phosphoramidite | 10-1961-95 | 50 μ mole |
| | 10-1961-90 | 100 μ mole |
| | 10-1961-02 | 0.25g |
| BHQ-2 Phosphoramidite | 10-1962-95 | 50 μ mole |
| | 10-1962-90 | 100 μ mole |
| | 10-1962-02 | 0.25g |
| 5'-BHQ-1 Phosphoramidite | 10-5931-95 | 50 μ mole |
| | 10-5931-90 | 100 μ mole |
| | 10-5931-02 | 0.25g |
| 5'-BHQ-2 Phosphoramidite | 10-5932-95 | 50 μ mole |
| | 10-5932-90 | 100 μ mole |
| | 10-5932-02 | 0.25g |
| BHQ-1-dT | 10-5941-95 | 50 μ mole |
| | 10-5941-90 | 100 μ mole |
| | 10-5941-02 | 0.25g |
| BHQ-2-dT | 10-5942-95 | 50 μ mole |
| | 10-5942-90 | 100 μ mole |
| | 10-5942-02 | 0.25g |



BLACK HOLE QUENCHER DYES (CONT.)

| Item | Cat. No. | Pack |
|----------------------------|------------|-----------|
| 3'-BHQ-1 CPG | 20-5931-01 | 0.1g |
| | 20-5931-10 | 1.0g |
| 1 μmole columns | 20-5931-41 | Pack of 4 |
| 0.2 μmole columns | 20-5931-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5931-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5931-14 | Pack of 1 |
| 3'-BHQ-2 CPG | 20-5932-01 | 0.1g |
| | 20-5932-10 | 1.0g |
| 1 μmole columns | 20-5932-41 | Pack of 4 |
| 0.2 μmole columns | 20-5932-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5932-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5932-14 | Pack of 1 |
| 3'-BHQ-3 CPG | 20-5933-01 | 0.1g |
| | 20-5933-10 | 1.0g |
| 1 μmole columns | 20-5933-41 | Pack of 4 |
| 0.2 μmole columns | 20-5933-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-5933-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-5933-14 | Pack of 1 |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

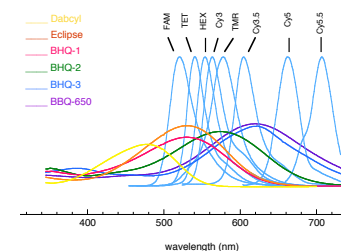
Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

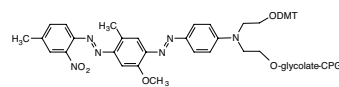
DYE QUENCHER PLOT



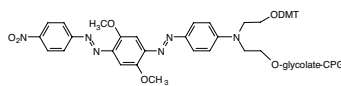
<https://www.glenresearch.com/spectral-characteristics-of-fluorescent-dyes>

RELATED

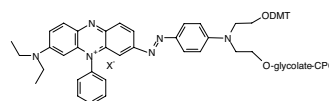
| | |
|----------|-----|
| Dabcyl | 106 |
| Eclipse™ | 116 |
| BBQ-650® | 120 |



3'-BHQ-1 CPG



3'-BHQ-2 CPG



3'-BHQ-3 CPG

BLACKBERRY® QUENCHER (BBQ-650®)

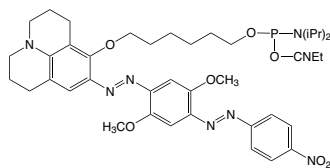
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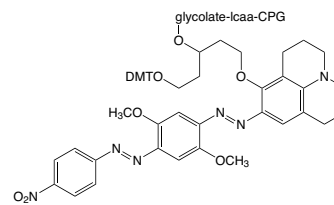
We are happy to offer several products containing the BlackBerry® Quencher (BBQ-650®), which exhibits a broad absorption profile from 550 nm to 750 nm, centered at 650 nm. This range offers more effective quenching of some of our popular long wavelength dyes like TAMRA, Redmond Red, Cy dyes and DyLight dyes. We offer BBQ-650 products for the 3' and 5' termini, as well as BBQ-650-dT for inclusion within the oligonucleotide sequence, with the following properties:

- Quenches the fluorescence of long wavelength dyes
- Quenches in FRET and contact mode
- Absorbance maximum at ~650 nm
- Quenching range – 550-750 nm
- Compatible with standard oligo synthesis chemistry
- Compatible with regular deprotection but requires mild deprotection with AMA at room temperature
- Available for 3', 5', and internal substitution
- More stable than BHQ-3

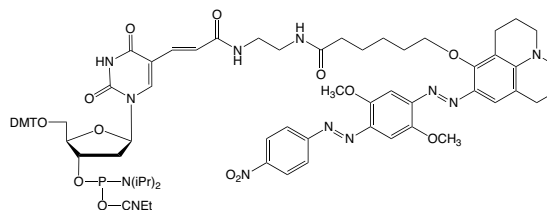
| Item | Cat. No. | Pack |
|-----------------------------|------------|-----------|
| 5'-BBQ-650® Phosphoramidite | 10-5934-95 | 50 µmole |
| | 10-5934-90 | 100 µmole |
| | 10-5934-02 | 0.25g |
| BBQ-650®-dT | 10-5944-95 | 50 µmole |
| | 10-5944-90 | 100 µmole |
| | 10-5944-02 | 0.25g |
| 3'-BBQ-650® CPG | 20-5934-01 | 0.1g |
| | 20-5934-10 | 1.0g |
| | 20-5934-41 | Pack of 4 |
| | 20-5934-42 | Pack of 4 |
| | 20-5934-13 | Pack of 1 |
| 15 µmole column (Expedite) | 20-5934-14 | Pack of 1 |



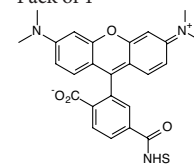
5'-BBQ-650™



3'-BBQ-650™ CPG



BBQ-650™-dT

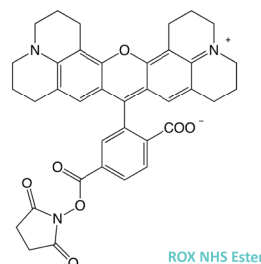
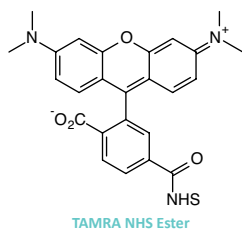
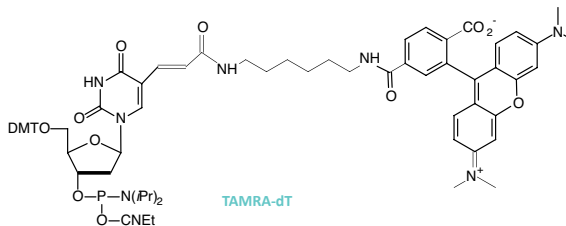
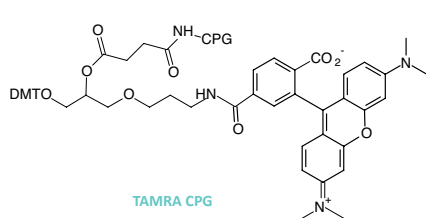


RHODAMINE (TAMRA) LABELING

Rhodamine derivatives are not sufficiently stable to survive conventional deprotection and these must be attached to amino-modified oligonucleotides using post-synthesis labeling techniques. Because Tetramethyl Rhodamine (TAMRA) is not base stable, the procedure to cleave and deprotect the labeled oligonucleotide must be carefully considered. Using the UltraMILD monomers and deprotection with potassium carbonate in methanol, TAMRA oligonucleotides can be fairly conveniently isolated. To streamline the preparation of TAMRA oligos, we offer 3'-TAMRA CPG for 3' labeling and TAMRA-dT for labeling within the sequence. We also offer TAMRA NHS ester for labeling amino-modified oligonucleotides.

ROX is a rhodamine dye that has played a significant role in dideoxy Sanger sequencing alongside FAM, JOE and TAMRA. The dye itself is also commonly used for qPCR applications as a passive reference dye. ROX is not available as a phosphoramidite, and as such, the use of this NHS ester is the standard method of incorporating ROX into oligonucleotides. This NHS ester is offered as the 6-isomer.

| Item | Cat. No. | Pack |
|---|------------|------------|
| 3'-TAMRA CPG | 20-5910-01 | 0.1g |
| | 20-5910-10 | 1.0g |
| 1 μmole columns | 20-5910-41 | Pack of 4 |
| 0.2 μmole columns | 20-5910-42 | Pack of 4 |
| 3'-TAMRA PS | 26-5910-01 | 0.1g |
| | 26-5910-10 | 1.0g |
| 200 nmole columns (ABI 3900) | 26-5910-52 | Pack of 10 |
| 40 nmole columns (ABI 3900) | 26-5910-55 | Pack of 10 |
| TAMRA-dT | 10-1057-95 | 50 μmole |
| | 10-1057-90 | 100 μmole |
| | 10-1057-02 | 0.25g |
| TAMRA NHS Ester (Solution in anhydrous DMSO) | 50-5910-66 | 60 μL |
| ROX NHS Ester | 50-5911-22 | 3.2mg |



RELATED

UltraMILD monomers.....27

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

ACRIDINE LABELING

Acridine phosphoramidite is designed to produce an oligonucleotide containing acridine at any position in the molecule. Acridine CPG is used to label the 3'-terminus. Acridine is an effective intercalating agent.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

For Instrument type *Add*

Expedite E
Applied Biosystems 3900 A
MerMade M

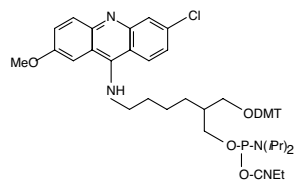
(Please inquire for availability of vials and columns for other instrument types.)

| Item | Cat. No. | Pack |
|---------------------------------|----------------------------|----------------|
| Acridine Phosphoramidite | 10-1973-95 | 50 μ mole |
| | 10-1973-90 | 100 μ mole |
| | 10-1973-02 | 0.25g |
| 3'-Acridine CPG | 20-2973-01 | 0.1g |
| | 20-2973-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | Pack of 1 | |

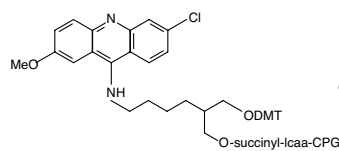
DNP LABELING

An analytical test based on detection of 2,4-dinitrophenyl (DNP) labeled oligonucleotides with anti-DNP antibodies has been proposed. We have chosen the branched triethylene glycol (TEG) spacer in our version of DNP phosphoramidite since it can be added once or several times to the 3' or 5' terminus.

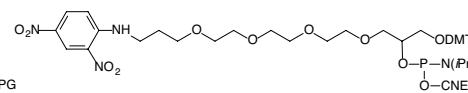
| Item | Catalog No. | Pack |
|-------------------------|-------------|----------------|
| DNP-TEG Phosphoramidite | 10-1985-95 | 50 μ mole |
| | 10-1985-90 | 100 μ mole |
| | 10-1985-02 | 0.25g |



Acridine



Acridine CPG



DNP-TEG

CHOLESTEROL LABELING

Potential therapeutic oligonucleotides must permeate the cell membrane for optimal activity. The addition of lipophilic groups to an oligonucleotide would be expected to enhance cellular uptake/membrane permeation. The use of cholesteryl oligos and the consequent improvement in activity has been described. We have designed our Cholesteryl products with triethyleneglycol (TEG) spacers for maximum solubility.

RELATED

Spermine.....54

| Item | Catalog No. | Pack |
|------------------------------------|-------------|----------------|
| Cholesteryl-TEG Phosphoramidite | 10-1975-95 | 50 μ mole |
| | 10-1975-90 | 100 μ mole |
| | 10-1975-02 | 0.25g |
| 5'-Cholesteryl-TEG Phosphoramidite | 10-1976-95 | 50 μ mole |
| | 10-1976-90 | 100 μ mole |
| | 10-1976-02 | 0.25g |
| 3'-Cholesteryl-TEG CPG | 20-2975-01 | 0.1g |
| | 20-2975-10 | 1.0g |
| | 20-2975-41 | Pack of 4 |
| | 20-2975-42 | Pack of 4 |
| | 20-2975-13 | Pack of 1 |
| | 20-2975-14 | Pack of 1 |
| 1 μ mole columns | | |
| 0.2 μ mole columns | | |
| 10 μ mole column (ABI) | | |
| 15 μ mole column (Expedite) | | |

TOCOPHEROL LABELING

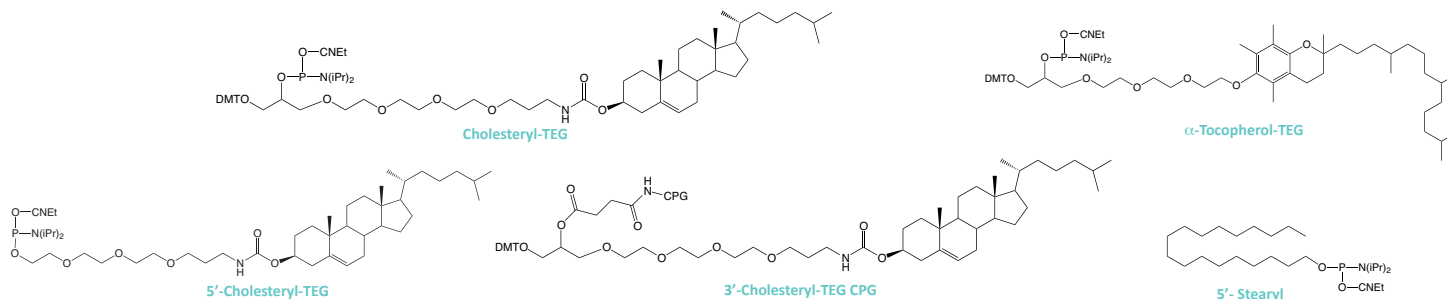
Vitamin E is both lipophilic and non-toxic even at high doses so would be an excellent candidate as a lipophilic carrier for oligonucleotides. Therefore, as an addition to our cholesteryl product line, we offer simple α -tocopheryl (vitamin E) labeling. Totally synthetic α -tocopherol is racemic at its three chiral centers and is used to prepare this product.

| Item | Catalog No. | Pack |
|--|-------------|----------------|
| α -Tocopherol-TEG Phosphoramidite | 10-1977-95 | 50 μ mole |
| | 10-1977-90 | 100 μ mole |
| | 10-1977-02 | 0.25g |

STEARYL LABELING

We now offer a simple C18 lipid as an economical and effective carrier molecule. We envisage that the 5'-stearyl group will become a favored lipophilic carrier for experimentation with synthetic oligonucleotides.

| Item | Catalog No. | Pack |
|-----------------------------|-------------|----------------|
| 5'- Stearyl Phosphoramidite | 10-1979-90 | 100 μ mole |
| | 10-1979-02 | 0.25g |



N-ACETYLGALACTOSAMINE (GalNAc) LABELING

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

INTELLECTUAL PROPERTY

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A directed approach to the delivery of therapeutic oligonucleotides specifically to the liver has been to target the asialoglycoprotein receptor (ASGPR) using a suitable glycoconjugate. Indeed, ASGPR is the ideal target for delivery of therapeutic oligonucleotides to the liver since it combines tissue specificity, high expression levels and rapid internalization and turnover. The use of oligonucleotide glycoconjugates has led to significant advances in therapeutic delivery as evidenced by the work of Alnylam Pharmaceuticals and Ionis Pharmaceuticals using multivalent N-acetylgalactosamine (GalNAc) oligonucleotide conjugates.

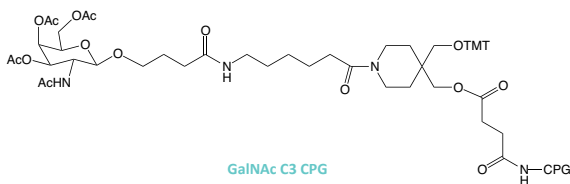
Glen Research is delighted to introduce a GalNAc modification strategy using a monomeric GalNAc support and the equivalent GalNAc phosphoramidite. Our experimental work has shown that these products are fully compatible with regular oligonucleotide synthesis and deprotection. Oligonucleotides containing GalNAc can be deprotected using standard procedures during which the acetyl protecting groups on GalNAc are removed. We have demonstrated that 5'-GalNAc C3 phosphoramidite can be used to prepare oligonucleotides with multiple consecutive GalNAc additions at the 5' terminus.

| Item | Catalog No. | Pack |
|------------------------------|---------------------------------|----------------|
| 5'-GalNAc C3 Phosphoramidite | 10-1974-95 | 50 μ mole |
| | 10-1974-90 | 100 μ mole |
| | 10-1974-02 | 0.25g |
| GalNAc C3 CPG | 20-2974-01 | 0.1g |
| | 20-2974-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| | 15 μ mole column (Expedite) | Pack of 1 |

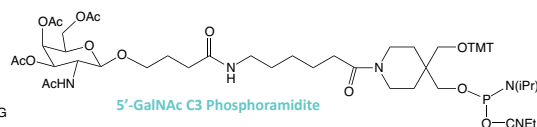
PALMITATE LABELING

Palmitate Phosphoramidite is a saturated fatty acid with a 16-carbon backbone. This 5'-modification is a lipophilic group. When incorporated into a synthetic oligonucleotide, Palmitate conjugates offer enhanced cellular uptake and delivery to extrahepatic tissues. The Serinol linker allows for the incorporation of modifications at the 3'-end, internally, and at the 5'-end during oligonucleotide synthesis.

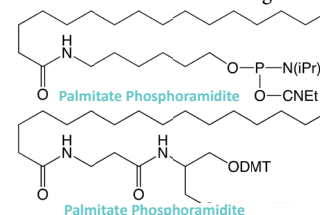
| Item | Catalog No. | Pack |
|-----------------------------------|-------------|----------------|
| Palmitate Phosphoramidite | 10-1978-95 | 50 μ mole |
| | 10-1978-90 | 100 μ mole |
| | 10-1978-02 | 0.25g |
| Palmitate Serinol Phosphoramidite | 10-1990-95 | 50 μ mole |
| | 10-1990-90 | 100 μ mole |
| | 10-1990-02 | 0.25g |



GalNAc C3 CPG



5'-GalNAc C3 Phosphoramidite



Palmitate Phosphoramidite

Palmitate Phosphoramidite

CDPI₃ MGB™ LABELING

The tripeptide of dihydropyrroloindole-carboxylate (CDPI₃) is a minor groove binding (MGB) moiety derived from the natural product CC-1065 with strong DNA binding properties. Synthetic oligonucleotides with covalently-attached CDPI₃ have enhanced DNA affinity and have improved the hybridization properties of sequence-specific DNA probes. Short CDPI₃-oligonucleotides hybridize with single-stranded DNA to give more stable DNA duplexes than unmodified ODNs of similar length. CDPI₃ MGB-oligonucleotide conjugates have been found to be useful in the following applications:

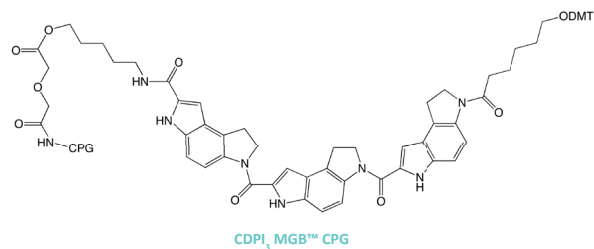
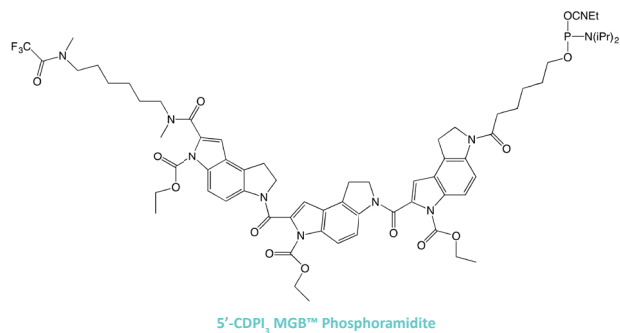
- Arrest of primer extension and PCR blockers
- Short and fluorogenic PCR primers
- Real-time PCR probes
- miRNA Inhibitors

The simplest approach to MGB probe design is to use an MGB support, add a quencher molecule as the first addition and complete the synthesis with a 5'-fluorophore. Alternatively, a fluorophore support could be used with the 5' terminus containing a quencher molecule followed by a final MGB addition at the 5' terminus. Glen Research offers 5'-CDPI₃ MGB™ Phosphoramidite and 3'-CDPI₃ MGB™ CPG.

5'-CDPI₃ MGB phosphoramidite was found to be hydrophobic enough that it required 10% THF in ACN to go completely into solution at a 0.1 M concentration and required a 3 minute coupling time. Deprotection can be carried out in EtOH/NH₄OH 1:3 (v/v) 17 hr at 55 °C and CDPI₃ MGB is compatible with GlenPak™ purification.

With the CDPI₃ MGB CPG, optimal results are obtained if UltraMild monomers and Cap A are used during synthesis along with 0.5 M CSO oxidizer. However, the use of standard monomers with iodine oxidation followed by deprotection with EtOH/NH₄OH 1:3 (v/v) for 17 hr at 55 °C will give acceptable results.

| Item | Catalog No. | Pack |
|---|-----------------------|-----------|
| 5'-CDPI ₃ MGB™ Phosphoramidite | 10-5924-95 | 50 μmole |
| | 10-5924-90 | 100 μmole |
| | 10-5924-02 | 0.25g |
| CDPI ₃ MGB™ CPG | 20-5924-01 | 0.1g |
| | 20-5924-10 | 1.0g |
| | 1 μmole columns | Pack of 4 |
| | 0.2 μmole columns | Pack of 4 |
| | 10 μmole column (ABI) | Pack of 1 |
| 15 μmole column (Expedite) | Pack of 1 | |



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MGB ECLIPSE® CPG

MGB Eclipse® pairs a minor groove binding (MGB) tripeptide with a dark quencher. The MGB significantly enhances hybridization while the Eclipse® has a broad absorption range that quenches many of the most common fluorophores including FAM, HEX, TET and Yakima Yellow®. Together, MGB Eclipse® is an attractive group for the synthesis of hydrolysis probes, the most common probe detection method for qPCR.

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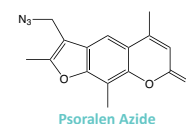
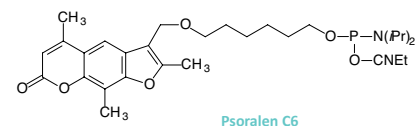
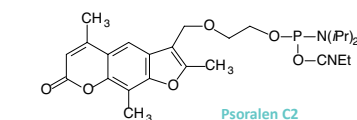
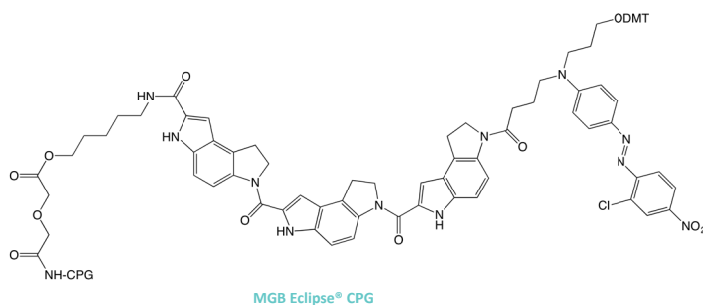
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| Item | Catalog No. | Pack |
|----------------------------|-------------|-----------|
| MGB Eclipse® CPG | 20-5927-01 | 0.1g |
| | 20-5927-10 | 1.0g |
| 1 µmole columns | 20-5927-41 | Pack of 4 |
| 0.2 µmole columns | 20-5927-42 | Pack of 4 |
| 10 µmole column (ABI) | 20-5927-13 | Pack of 1 |
| 15 µmole column (Expedite) | 20-5927-14 | Pack of 1 |

PSORALEN LABELING

Psoralen C2 at the 5'-terminus of an oligonucleotide serves effectively as a cross-linking reagent in double-stranded oligonucleotides. The 6 atom spacer arm of Psoralen C6 allows cross-linking with a triplex oligonucleotide strand. Click Chemistry with psoralen azide and one of our many nucleosidic and non-nucleosidic alkyne derivatives has the potential to generate a variety of practical cross-linkers. The well known reversible cross-linking behavior of psoralen with an adjacent thymidine residue could be very useful.

| Item | Cat. No. | Pack |
|-----------------------------|------------|-----------|
| Psoralen C2 Phosphoramidite | 10-1982-90 | 100 µmole |
| | 10-1982-02 | 0.25g |
| Psoralen C6 Phosphoramidite | 10-1983-90 | 100 µmole |
| | 10-1983-02 | 0.25g |
| Psoralen Azide | 50-2009-92 | 25 µmole |
| | 50-2009-90 | 100 µmole |



EDTA LABELING

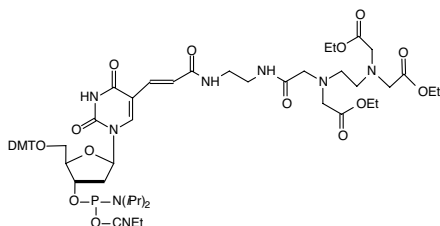
EDTA-C2-dT phosphoramidite contains the triethyl ester of EDTA which allows sequence-specific cleavage of single- and double-stranded DNA and RNA. The cleavage reaction is only initiated once Fe(II) and dithiothreitol are added and so is readily controlled. Coupling of EDTA-dT is normal but cleavage and deprotection should be carried out with sodium hydroxide in aqueous methanol (0.4M NaOH in methanol/water 4:1) overnight at room temperature.

| Item | Cat. No. | Pack |
|-------------------------------|------------|----------------|
| EDTA-C2-dT-CE Phosphoramidite | 10-1059-95 | 50 μ mole |
| | 10-1059-90 | 100 μ mole |
| | 10-1059-02 | 0.25g |

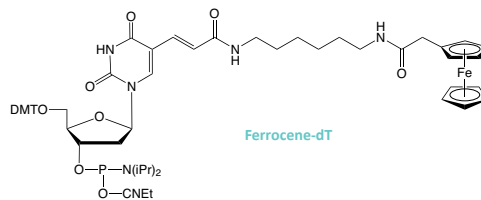
FERROCENE LABELING

With an excellent stability profile, ferrocene has always attracted considerable interest for DNA labeling to generate probes for electrochemical detection. Based on our Amino-Modifier C6-dT structure, Ferrocene-dT is easily added to oligonucleotides with no disruption of regular hybridization behavior. Multiple incorporations into an oligonucleotide probe are also simply achieved. Oligonucleotides are deprotected using standard techniques. Ferrocene oligonucleotides should be stored under Argon and aqueous solutions should be degassed immediately.

| Item | Cat. No. | Pack |
|---------------------------------|------------|----------------|
| Ferrocene-dT-CE Phosphoramidite | 10-1576-95 | 50 μ mole |
| | 10-1576-90 | 100 μ mole |
| | 10-1576-02 | 0.25g |



EDTA-C2-dT



Ferrocene-dT

INTELLECTUAL PROPERTY

Methylene Blue II is covered under European patent EP2820003 and US patent US9540405 and is sold under license from the University of Lyon.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

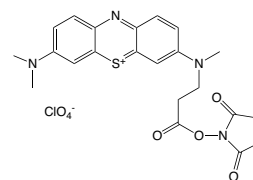
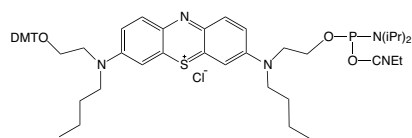
(Please inquire for availability of vials and columns for other instrument types.)

METHYLENE BLUE LABELING

Methylene Blue, which belongs to the phenothiazine family of dyes, is a unique dye with a variety of useful properties. Despite its high extinction coefficient in the visible region (81,000 L/mol·cm), it is weakly fluorescent due to its high rate of intersystem crossing from the S_1 excited state to the T_1 triplet state. This property makes it an excellent photosensitizer, and it has been used extensively to produce highly reactive singlet oxygen. Methylene blue has the ability to both intercalate in duplex DNA, preferring G:C over T:A base pairs, and can act as an electrochemical redox probe. Methylene blue has also been shown to be unmatched in performance as a redox-active reporter for electrochemical biosensors.

Earlier, we introduced Methylene Blue C3 Phosphoramidite but this product proved to have quite limited stability and has been discontinued. As an alternative option, we introduced Methylene Blue NHS Ester to allow researchers to label amino-modified oligonucleotides with this interesting dye. With the encouragement and technical expertise of Carole Chaix and her colleagues at the University of Lyon, we decided to prepare an alternative structure that seemed to have a much superior stability profile - Methylene Blue II Phosphoramidite. Fortunately, this structure did indeed prove more stable and we are now able to offer again a Methylene Blue Phosphoramidite.

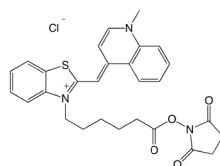
| Item | Cat. No. | Pack |
|--|------------|----------------|
| Methylene Blue NHS Ester (Dissolve 5.4mg in 60 μ L of DMSO) | 50-1960-23 | 5.4mg |
| Methylene Blue II Phosphoramidite | 10-5961-95 | 50 μ mole |
| | 10-5961-90 | 100 μ mole |
| | 10-5961-02 | 0.25g |



LABELING WITH THIAZOLE ORANGE

Thiazole orange is an asymmetric cyanine dye whose fluorescence can be quite dependent on its local environment. When an oligonucleotide labeled with thiazole orange is hybridized to its complementary sequence, the thiazole orange acts as an intercalator. In addition to providing enhanced thermal stability, the dye adopts a mostly planar configuration resulting in significantly enhanced fluorescence. This “light up” effect can be as high as 34-fold depending on the sequence and how the dye is attached. This NHS ester will allow simple functionalization of internally located amino modifications such as those generated with amino-modifier C6 dT (10-1039).

| Item | Cat. No. | Pack |
|---------------------------|------------|-------|
| Thiazole Orange NHS Ester | 50-1970-23 | 5.4mg |



Thiazole Orange NHS Ester

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

FLUORESCENT DYES

| | Absorbance Maximum | Emission Maximum | Excimer |
|-------------|--------------------|------------------|----------------|
| Pyrene-dU | 402nm | 472nm | 486nm |
| Perylene-dU | 473nm | 490nm | Not Determined |

LABELING WITH METAL CHELATES

2,2'-Dipicolylamine Phosphoramidite has been discontinued. This product was manufactured and developed by Syntrix Biosystems Inc. For further information, please contact:

Dean Y. Maeda, Ph.D., M.B.A.
 Director, Chemistry and Preclinical Development
 Syntrix Biosystems
 215 Clay St NW Ste B5
 Auburn, WA 98001
 tel: 253-833-8009 ext. 23
 fax: 253-833-8127
Dmaeda@syntrixbio.com

LABELING FOR PHOTO-REGULATION OF OLIGONUCLEOTIDES

Photo-control, the use of ultraviolet or visible light to control a reaction, has a number of advantages over other external stimuli:

- Light does not introduce contaminants into the reaction system,
- Excitation wavelength can be controlled through the design of the photo-responsive molecule, and
- It is now straightforward to control irradiation time and/or local excitation.

When a photo-responsive molecule is directly attached to DNA as a receptor, photo-regulation of the bioprocess regulated by that DNA molecule could, in principle, be achieved. Such photo-responsive DNA could also be used as a switch in a DNA-based nano-machine. Professor Hiroyuki Asanuma and his group at the department of Molecular Design and Engineering of the Graduate School of Engineering of the Nagoya University (Japan) have developed an efficient method to achieve this goal. They have attached azobenzene to DNA and made it photo-responsive^{1,2}. Azobenzene is a typical photo-responsive molecule that isomerizes from its planar trans-form to the non-planar *cis*-form after UV-light irradiation with a wavelength between 300 nm and 400 nm (λ_{max} is around 330 nm). Interestingly, the system reverts from the *cis*-form to the *trans*-form after further irradiation with visible light (wavelength over 400 nm). This process is completely reversible, and the azobenzene group does not decompose or induce undesirable side reactions even on repeated *trans*-*cis* isomerization. By introducing azobenzenes into DNA through D-threosinol as a linker, Asanuma and co-workers succeeded in achieving photo-regulation of:

- Formation and dissociation of a DNA duplex^{3,4} and
- Transcription by T7-RNA polymerase reaction^{5,6,7}

REFERENCES

- (1) H. Asanuma, et al., *Angew Chem Int Ed*, 2001, **40**, 2671-2673.
- (2) T. Takarada, et al., *Chem Lett*, 2001, **30**, 732.
- (3) H. Asanuma, X.G. Liang, T. Yoshida, and M. Komiyama, *ChemBiochem*, 2001, **2**, 39-44.
- (4) H. Asanuma, D. Matsunaga, and M. Komiyama, *NUCLEIC ACIDS SYMP SER (OXF)*, 2005, **49**, 35.
- (5) H. Asanuma, et al., *ChemBiochem*, 2002, **3**, 786.
- (6) M. Liu, H. Asanuma, and M. Komiyama, *J. Amer. Chem. Soc.*, 2006, **128**, 1009.
- (7) H. Asanuma, et al., *Nature Protocols*, 2007, **2**, 203-212.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

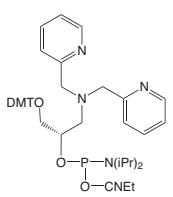
Columns

For Instrument type Add

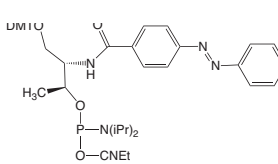
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

| Item | Catalog No. | Pack |
|----------------------------|-------------|----------------|
| Azobenzene Phosphoramidite | 10-5800-95 | 50 μ mole |
| | 10-5800-90 | 100 μ mole |
| | 10-5800-02 | 0.25g |



2,2'-Dipicolylamine

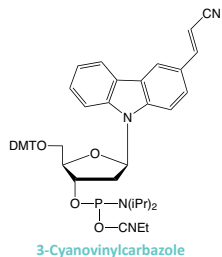


Azobenzene Phosphoramidite

QUENCHED AUTOLIGATION (QUAL) PROBES

REFERENCES

- (1) Y. Yoshimura, and K. Fujimoto, *Org Lett*, 2008, **10**, 3227-30.
- (2) K. Fujimoto, K. Konishi-Hiratsuka, T. Sakamoto, and Y. Yoshimura, *ChemBioChem*, 2010, **11**, 1661-4.
- (3) Y. Yoshimura, T. Ohtake, H. Okada, and K. Fujimoto, *ChemBioChem*, 2009, **10**, 1473-6.



QUAL probes² consist of two oligonucleotides, the first containing a nucleophilic group at the 3'-terminus, while the second has an electrophilic group at the 5'-terminus. When the probe pair finds the target, the oligos line up with the 3'-terminus of the first directly adjacent to the 5'-terminus of the second. An autoligation reaction then takes place to combine the two oligos into a single probe. As usual, the 3' nucleophilic group is the 3-thiophosphate, easily prepared using 3'-phosphate CPG with a sulfurizing step in the first cycle. In this case, the electrophilic group is a 5'-dabsyl group, which is an excellent leaving group as well as a fine quencher of fluorescence. The second oligo, therefore, contains a fluorophore which is quenched by the dabsyl group. A popular choice for fluorophore is fluorescein-dT but it is easy to imagine that a variety of fluorophores could be attached to any of the commercially available amino-modified nucleoside phosphoramidites.

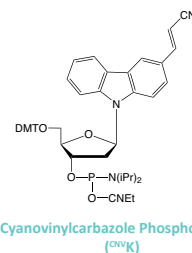
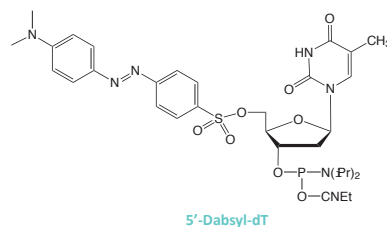
| Item | Catalog No. | Pack |
|---------------------------------|-------------|----------------|
| 5'-Dabsyl-dT-CE Phosphoramidite | 10-1532-90 | 100 μ mole |
| | 10-1532-02 | 0.25g |

LABELING WITH ULTRAFAST PHOTO CROSS-LINKER

When 3-cyanovinylcarbazole nucleoside (^{CNVK}) is incorporated into an oligonucleotide, very rapid photo cross-linking to the complementary strand can be induced at one wavelength and rapid reversal of the cross-link is possible at a second wavelength. Neither wavelength has the potential to cause significant DNA damage. Irradiation of a duplex containing a single incorporation of ^{CNVK} at 366 nm led to 100% cross-linking to thymine base in 1 second, although complete cross-linking to cytosine takes 25 seconds.¹ A 30 second irradiation time should cover all situations. In addition, it was demonstrated that the purine bases were unreactive to cross-linking, allowing differentiation between pyrimidines and purines at the target site. The authors also determined the effect of sequence contexts around the ^{CNVK} site and demonstrated that the identity of bases on either side of the cross-linking site has little effect on the reaction. Once cross-linked, the UV melting temperature of the duplex was raised by around 30 °C relative to the duplex before irradiation. Complete reversal of the cross-link takes place at 312 nm in 3 minutes. This facile reversal reaction is, therefore, accomplished with no damage to normal DNA.

In a later publication, a further application of this cross-linking technique was investigated.² When ^{CNVK} was cross-linked with a dC residue in duplex DNA, heating at 90° C for 3.5 hours led to deamination of the cytosine base to form uracil in the complementary strand. Reversal of the cross-link at 312 nm led to a DNA strand in which dC had been converted to dU. The authors showed that this transformation is specific for the dC residue opposite the ^{CNVK} and any further adjacent dC residues are unaffected. Similarly, the authors have shown that ^{CNVK} can be cross-linked to an adjacent RNA strand.³

| Item | Cat. No. | Pack |
|---|------------|----------------|
| 3-Cyanovinylcarbazole Phosphoramidite (^{CNVK}) | 10-4960-95 | 50 μ mole |
| | 10-4960-90 | 100 μ mole |
| | 10-4960-02 | 0.25g |



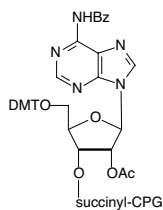
RNA SUPPORTS FOR 3' MODIFICATION

Glen Research offers RNA supports in which protected ribonucleosides are attached to CPG. With 5'-DMT protection, and all other protecting groups base-labile, the use of these supports is identical to DNA supports. These supports are suitable for use in producing oligodeoxynucleotides modified at the 3'-terminus or oligoribonucleotides. ABI-style columns are supplied unless otherwise requested (see note box).

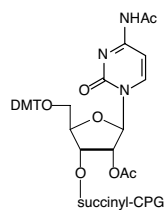
ABBREVIATIONS

Ac = Acetyl
 Bz = Benzoyl
 CNEt = Cyanoethyl
 CPG = Controlled Pore Glass
 DMT = 4,4'-Dimethoxytrityl

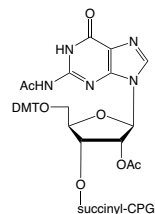
| Item | Catalog No. | Pack | |
|---------------------------------|-----------------------------|------------|-----------|
| Bz-A-RNA-CPG | 20-3303-01 | 0.1g | |
| | 20-3303-02 | 0.25g | |
| | 20-3303-10 | 1.0g | |
| | 1 μ mole columns | 20-3403-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3403-42 | Pack of 4 |
| | 10 μ mole columns (ABI) | 20-3403-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3403-14 | Pack of 1 | |
| Ac-C-RNA-CPG | 20-3315-01 | 0.1g | |
| | 20-3315-02 | 0.25g | |
| | 20-3315-10 | 1.0g | |
| | 1 μ mole columns | 20-3415-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3415-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3415-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3415-14 | Pack of 1 | |
| Ac-G-RNA-CPG | 20-3324-01 | 0.1g | |
| | 20-3324-02 | 0.25g | |
| | 20-3324-10 | 1.0g | |
| | 1 μ mole columns | 20-3424-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3424-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3424-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3424-14 | Pack of 1 | |
| U-RNA-CPG | 20-3330-01 | 0.1g | |
| | 20-3330-02 | 0.25g | |
| | 20-3330-10 | 1.0g | |
| | 1 μ mole columns | 20-3430-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3430-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3430-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3430-14 | Pack of 1 | |



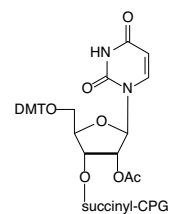
Bz-A-CPG



Ac-C-CPG

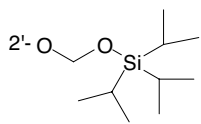


Ac-G-CPG



U-CPG

INTELLECTUAL PROPERTY



TOM-Protecting-Group™

TOM-Protecting-Group is a trademark of QIAGEN.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

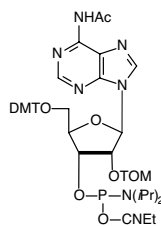
TOM-PROTECTED RNA PHOSPHoramidites

RNA synthesis using monomers containing the 2'-O-TriisopropylsilyloxyMethyl (TOM) group (TOM-Protecting-Group™) is characterized by very high coupling efficiency along with fast, simple deprotection. High coupling efficiency is achieved because the TOM-Protecting-Group exhibits lower steric hindrance than the 2'-O-t-butyldimethylsilyl (TBDMS) group used in our alternative RNA monomers. Fast and reliable deprotection is achieved using methylamine in ethanol/water at room temperature. A further feature of the TOM-Protecting-Group is that during basic steps it can not undergo 2' to 3' migration. This migration under basic conditions leads to non-biologically active 2'-5' linkages when using the TBDMS group. These features allow the TOM-Protected monomers to produce longer oligonucleotides. TOM-Protected RNA monomers are also fully compatible with minor bases with 2'-O-TBDMS protection.

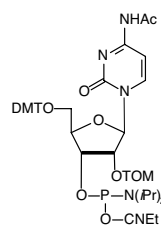
| Item | Catalog No. | Pack |
|--------------------------|-------------|-------|
| A-TOM-CE Phosphoramidite | 10-3004-02 | 0.25g |
| | 10-3004-05 | 0.5g |
| | 10-3004-10 | 1.0g |
| C-TOM-CE Phosphoramidite | 10-3014-02 | 0.25g |
| | 10-3014-05 | 0.5g |
| | 10-3014-10 | 1.0g |
| G-TOM-CE Phosphoramidite | 10-3024-02 | 0.25g |
| | 10-3024-05 | 0.5g |
| | 10-3024-10 | 1.0g |
| U-TOM-CE Phosphoramidite | 10-3034-02 | 0.25g |
| | 10-3034-05 | 0.5g |
| | 10-3034-10 | 1.0g |

RNA SUPPORTS FOR TOM RNA SYNTHESIS

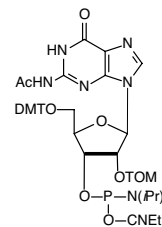
| Item | Catalog No. | Pack |
|----------------------------|-------------|-----------|
| Ac-A-RNA-CPG | 20-3304-01 | 0.1g |
| | 20-3304-02 | 0.25g |
| | 20-3304-10 | 1.0g |
| | 20-3404-41 | Pack of 4 |
| 1 μmole columns | 20-3404-41 | Pack of 4 |
| 0.2 μmole columns | 20-3404-42 | Pack of 4 |
| 10 μmole column (ABI) | 20-3404-13 | Pack of 1 |
| 15 μmole column (Expedite) | 20-3404-14 | Pack of 1 |



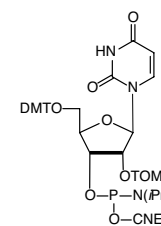
A-TOM



C-TOM



G-TOM



U-TOM

RNA SUPPORTS FOR TOM RNA SYNTHESIS (CONT.)

| Item | Catalog No. | Pack |
|---------------------------------|------------------------|-----------|
| Ac-C-RNA-CPG | 20-3315-01 | 0.1g |
| | 20-3315-02 | 0.25g |
| | 20-3315-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3415-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3415-14 | Pack of 1 |
| Ac-G-RNA-CPG | 20-3324-01 | 0.1g |
| | 20-3324-02 | 0.25g |
| | 20-3324-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3424-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3424-14 | Pack of 1 |
| U-RNA-CPG | 20-3330-01 | 0.1g |
| | 20-3330-02 | 0.25g |
| | 20-3330-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3430-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3430-14 | Pack of 1 |

TBDMS-PROTECTED RNA PHOSPHoramidites

ABBREVIATIONS

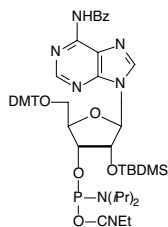
Bz = Benzoyl
 CNEt = Cyanoethyl
 CPG = Controlled Pore Glass
 dmf = Dimethylformamide
 DMT = 4,4'-Dimethoxytrityl
 iPr = Isopropyl
 lcaa = long chain alkylamino
 Pac = Phenoxyacetyl
 PhOAc = Phenoxyacetyl
 TBDMS = t-Butyl-dimethylsilyl

INSTRUMENT TYPES

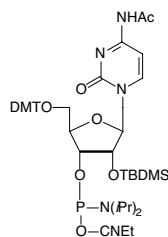
Glen Research packages these monomers in a variety of industry-standard vials and bottles. Please provide the exact specification of the bottle required prior to receiving a quotation.

Glen Research CE (β -cyanoethyl) Phosphoramidites for RNA synthesis are produced and packaged to ensure the highest performance on commercial synthesizers. Every batch is accompanied by a Certificate of Analysis and an HPLC trace, showing the results of our QC testing. RNA Phosphoramidites are synthesis-tested with a minimum coupling efficiency of 97%. Glen Research RNA monomers are packaged in industry standard vials which are specially cleaned to eliminate particulate contamination. These monomers are available in a variety of packs, including high throughput (HT) and low cost (LC). An UltraMild set is also available for situations where sensitive bases are in use. Dmf-G (10-3029) has been discontinued and may be substituted with Ac-G (10-3025).

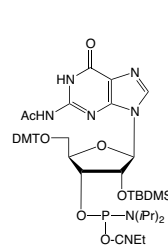
| Item | Catalog No. | Pack |
|-------------------------|-------------|-------|
| Bz-A-CE Phosphoramidite | 10-3003-02 | 0.25g |
| | 10-3003-05 | 0.5g |
| | 10-3003-10 | 1.0g |
| Ac-C-CE Phosphoramidite | 10-3015-02 | 0.25g |
| | 10-3015-05 | 0.5g |
| | 10-3015-10 | 1.0g |
| Ac-G-CE Phosphoramidite | 10-3025-02 | 0.25g |
| | 10-3025-05 | 0.5g |
| | 10-3025-10 | 1.0g |
| U-CE Phosphoramidite | 10-3030-02 | 0.25g |
| | 10-3030-05 | 0.5g |
| | 10-3030-10 | 1.0g |



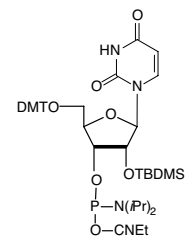
Bz-A-CE Phosphoramidite



Ac-C-CE Phosphoramidite



Ac-G-CE Phosphoramidite



U-CE Phosphoramidite

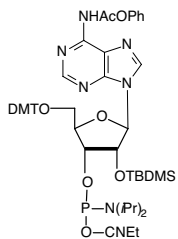
ULTRAMILD TBDMS RNA PHOSPHoramidites

| Item | Catalog No. | Pack |
|------------------------------|-------------|-------|
| Pac-A-CE Phosphoramidite | 10-3000-02 | 0.25g |
| | 10-3000-05 | 0.5g |
| | 10-3000-10 | 1.0g |
| Ac-C-CE Phosphoramidite | 10-3015-02 | 0.25g |
| | 10-3015-05 | 0.5g |
| | 10-3015-10 | 1.0g |
| iPr-Pac-G-CE Phosphoramidite | 10-3021-02 | 0.25g |
| | 10-3021-05 | 0.5g |
| | 10-3021-10 | 1.0g |
| U-CE Phosphoramidite | 10-3030-02 | 0.25g |
| | 10-3030-05 | 0.5g |
| | 10-3030-10 | 1.0g |

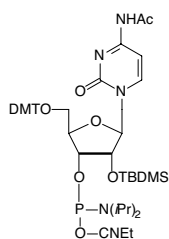
TBDMS RNA SUPPORTS

ABI-style columns are supplied for 1 μ mole and 0.2 μ mole scales unless otherwise requested (see note box).

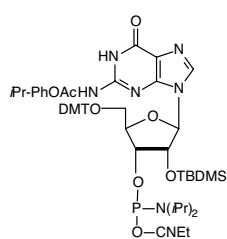
| Item | Catalog No. | Pack |
|---------------------------------|----------------------------|-----------|
| Pac-A-RNA-CPG | 20-3300-01 | 0.1g |
| | 20-3300-02 | 0.25g |
| | 20-3300-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | Pack of 1 | |
| Bz-A-RNA-CPG | 20-3303-01 | 0.1g |
| | 20-3303-02 | 0.25g |
| | 20-3303-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| | 10 μ mole column (ABI) | Pack of 1 |
| 15 μ mole column (Expedite) | Pack of 1 | |



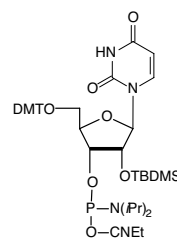
Pac-A-CE Phosphoramidite



Ac-C-CE Phosphoramidite



iPr-Pac-G-CE Phosphoramidite



U-CE Phosphoramidite

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

TBDMS RNA SUPPORTS (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

Expedite E
MerMade M

Columns

For Instrument type *Add*

Expedite E
Applied Biosystems 3900 A
MerMade M

(Please inquire for availability of vials and columns for other instrument types.)

| Item | Catalog No. | Pack | |
|---------------------------------|----------------------------|------------|-----------|
| Ac-C-RNA-CPG | 20-3315-01 | 0.1g | |
| | 20-3315-02 | 0.25g | |
| | 20-3315-10 | 1.0g | |
| | 1 μ mole columns | 20-3415-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3415-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3415-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3415-14 | Pack of 1 | |
| iPr-Pac-G-RNA-CPG | 20-3321-01 | 0.1g | |
| | 20-3321-02 | 0.25g | |
| | 20-3321-10 | 1.0g | |
| | 1 μ mole columns | 20-3421-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3421-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3421-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3421-14 | Pack of 1 | |
| Ac-G-RNA-CPG | 20-3324-01 | 0.1g | |
| | 20-3324-02 | 0.25g | |
| | 20-3324-10 | 1.0g | |
| | 1 μ mole columns | 20-3424-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3424-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3424-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3424-14 | Pack of 1 | |
| U-RNA-CPG | 20-3330-01 | 0.1g | |
| | 20-3330-02 | 0.25g | |
| | 20-3330-10 | 1.0g | |
| | 1 μ mole columns | 20-3430-41 | Pack of 4 |
| | 0.2 μ mole columns | 20-3430-42 | Pack of 4 |
| | 10 μ mole column (ABI) | 20-3430-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3430-14 | Pack of 1 | |

ULTRAMILD SOLVENTS/REAGENTS

| Item | Catalog No. | Pack |
|---|-------------|-------|
| <i>Cap Mix A</i> THF/Pyridine/Pac ₂ O (Applied Biosystems) | 40-4210-52 | 200mL |
| | 40-4210-57 | 450mL |
| THF/Pac ₂ O (Expedite) | 40-4212-52 | 200mL |
| | 40-4212-57 | 450mL |
| <i>Deprotection Solution</i> 0.05M Potassium Carbonate in Methanol | 60-4600-30 | 30mL |
| | 60-4600-52 | 200mL |
| | 60-4600-57 | 450mL |

MINOR RNA PHOSPHoramIDITES (TOM PROTECTED)

Glen Research offers minor RNA phosphoramidites with either TOM or TBDMS protecting groups. 4-Thio-U, 5-Methyl-Cytidine, and 2-Amino-Adenosine are useful for analyzing RNA structure and activity relationships, for example, in ribozyme studies.

Pyrrolo-C is a fluorescent nucleoside whose fluorescence is sensitive to its environment and is ideal for probing RNA structure. It base-pairs as a normal C nucleotide. It is highly fluorescent and its excitation and emission are well suited to the red of most fluorescent nucleotide analogs, which eliminates or reduces background fluorescence from proteins. Pyrrolo-CTP has potential uses in biological assay development.

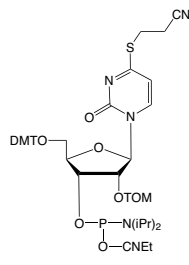
rSpacer is used to introduce an abasic site to an RNA sequence. The TOM protected version has been discontinued and is replaced with the TBDMS version.

The protecting scheme for 2,6-Diaminopurine has been changed and the original product (10-3084) has been replaced with the optimized product (10-3085) below.

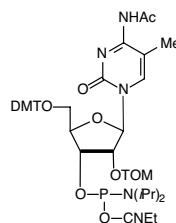
RELATED

| | |
|----------------------------|-----|
| Minor TBDMS monomers | 141 |
| Pyrrolo-CTP | 144 |
| rSpacer TBDMS | 142 |

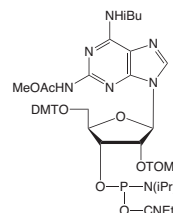
| Item | Catalog No. | Pack |
|---|-------------|----------------|
| 4-Thio-U-TOM-CE Phosphoramidite | 10-3052-95 | 50 μ mole |
| | 10-3052-90 | 100 μ mole |
| | 10-3052-02 | 0.25g |
| 5-Me-C-TOM-CE Phosphoramidite | 10-3064-95 | 50 μ mole |
| | 10-3064-90 | 100 μ mole |
| | 10-3064-02 | 0.25g |
| 2,6-Diaminopurine-TOM-CE Phosphoramidite (2-amino-A) | 10-3085-95 | 50 μ mole |
| | 10-3085-90 | 100 μ mole |
| | 10-3085-02 | 0.25g |



4-Thio-U-TOM



5-Me-C-TOM



2,6-diaminopurine-TOM

MINOR RNA PHOSPHoramidites (TOM PROTECTED) (CONT.)

RELATED

| | |
|-------------------|-----|
| Pyrrolo-dC | 74 |
| Pyrrolo-CTP | 144 |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

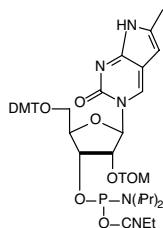
(Please inquire for availability of vials and columns for other instrument types.)

| Item | Catalog No. | Pack |
|----------------------------------|-------------|----------------|
| Pyrrolo-C-TOM-CE Phosphoramidite | 10-3017-95 | 50 μ mole |
| | 10-3017-90 | 100 μ mole |
| | 10-3017-02 | 0.25g |

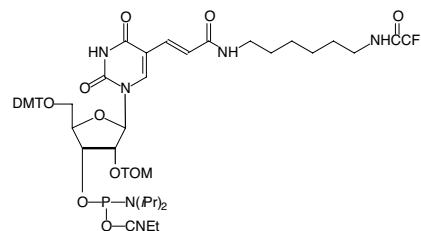
RNA SEQUENCE MODIFIER (TOM PROTECTED)

Amino-Modifier C6-U has been added to the growing family of sequence modifiers and we envisage applications in RNA structural studies as well as for labeling siRNA to probe uptake and cellular distribution.

| Item | Catalog No. | Pack |
|-------------------------------------|-------------|----------------|
| Amino-Modifier C6-U Phosphoramidite | 10-3039-95 | 50 μ mole |
| | 10-3039-90 | 100 μ mole |
| | 10-3039-02 | 0.25g |



Pyrrolo-C-TOM

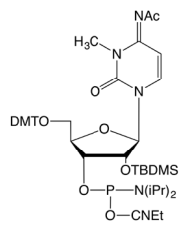


Amino-Modifier C6-U

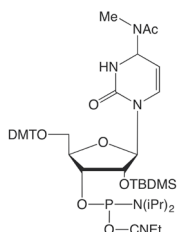
MINOR RNA PHOSPHoramidites (TBDMS PROTECTED)

Inosine and 5-Methyl-Uridine are useful for analyzing RNA structure and activity relationships. 5-Bromo-Uridine and 5-Iodo-Uridine have been used for crystallography studies and cross-linking experiments. 6-Thioguanosine (6-thio-G) has applications in ribozyme and siRNA research, as well as in RNA-protein interactions. The removal of the silyl protecting group without interfering with the sulfur is critical. This is removed¹ cleanly by triethylamine trihydrofluoride in DMSO but t-butylammonium fluoride (TBAF) leads to degradation of the thio-nucleotide analogue and should not be used. 2-Aminopurine riboside is useful for analyzing RNA structure and activity relationships, for example, in ribozyme studies.

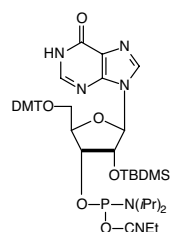
| Item | Catalog No. | Pack |
|----------------------------------|-------------|----------------|
| N3-Methyl-C-CE Phosphoramidite | 10-3013-95 | 50 μ mole |
| | 10-3013-90 | 100 μ mole |
| | 10-3013-02 | 0.25g |
| N4-Methyl-C-CE Phosphoramidite | 10-3016-95 | 50 μ mole |
| | 10-3016-90 | 100 μ mole |
| | 10-3016-02 | 0.25g |
| I-CE Phosphoramidite | 10-3040-95 | 50 μ mole |
| | 10-3040-90 | 100 μ mole |
| | 10-3040-02 | 0.25g |
| 5-Me-U-CE Phosphoramidite (T) | 10-3050-95 | 50 μ mole |
| | 10-3050-90 | 100 μ mole |
| | 10-3050-02 | 0.25g |
| Br-U-CE Phosphoramidite | 10-3090-95 | 50 μ mole |
| | 10-3090-90 | 100 μ mole |
| | 10-3090-02 | 0.25g |
| I-U-CE Phosphoramidite | 10-3091-95 | 50 μ mole |
| | 10-3091-90 | 100 μ mole |
| | 10-3091-02 | 0.25g |
| 6-Thio-G-CE Phosphoramidite | 10-3072-95 | 50 μ mole |
| | 10-3072-90 | 100 μ mole |
| | 10-3072-02 | 0.25g |
| 2-Aminopurine-CE Phosphoramidite | 10-3070-95 | 50 μ mole |
| | 10-3070-90 | 100 μ mole |
| | 10-3070-02 | 0.25g |



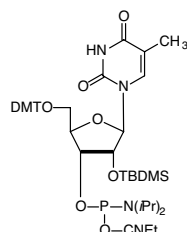
N3-Methyl-C



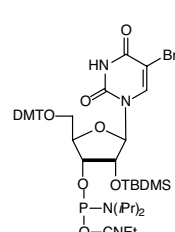
N4-Methyl-C



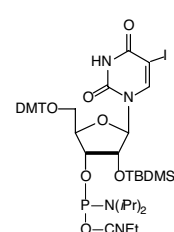
Inosine



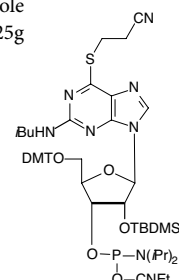
5-Me-U



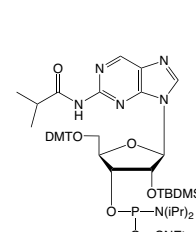
Br-U



I-U



6-Thio-G



2-Aminopurine

RELATED

Minor TOM monomers 139

REFERENCES

- (1) C.J. Adams, J.B. Murray, M.A. Farrow, J.R.P. Arnold, and P.G. Stockley, *Tetrahedron Lett.*, 1995, **36**, 5421-5424.
- (2) D.A. Berry, et al., *Tetrahedron Lett.*, 2004, **45**, 2457-2461.

MINOR RNA (TBDMS PROTECTED) (CONT.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers
For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns
For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

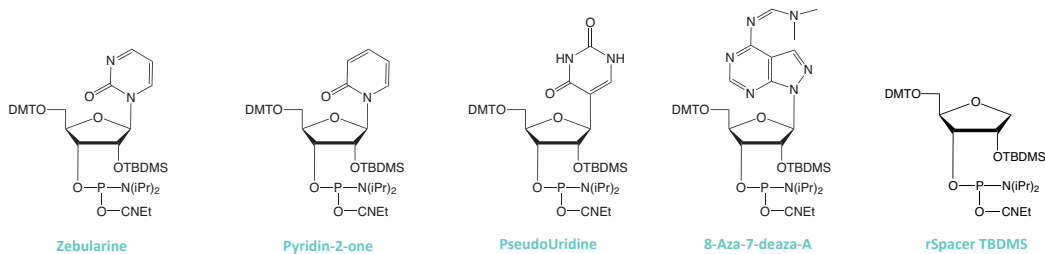
8-Aza-7-deaza-Adenosine is an isomer of Adenosine with virtually identical electron density. The N7 nitrogen is not available for hydrogen bonding.

Ribozyme activity is substantially affected by the substitution of modified pyrimidine bases. Zebularine (pyrimidin-2-one ribonucleoside) may be regarded as a Cytidine derivative lacking the exocyclic amino group. Zebularine and Pyridin-2-one Ribonucleoside, the 3-deaza analogue of Zebularine, are prime candidates for use in evaluating ribozyme activity and function. It should be noted that Zebularine is mildly fluorescent, absorbing at 298 nm and emitting at 367 nm.

PseudoUridine is one of the most common modified nucleosides found in RNA. The availability of a phosphoramidite will allow detailed research into the effects of this modified base on RNA structure and activity.

rSpacer is used to introduce an abasic site to an RNA sequence.

| Item | Catalog No. | Pack |
|------------------------------------|-------------|----------------|
| Zebularine-CE Phosphoramidite | 10-3011-95 | 50 μ mole |
| | 10-3011-90 | 100 μ mole |
| | 10-3011-02 | 0.25g |
| Pyridin-2-one-CE Phosphoramidite | 10-3012 | Discontinued |
| PseudoUridine-CE Phosphoramidite | 10-3055-95 | 50 μ mole |
| | 10-3055-90 | 100 μ mole |
| | 10-3055-02 | 0.25g |
| 8-Aza-7-deaza-A-CE Phosphoramidite | 10-3083 | Discontinued |
| rSpacer TBDMS CE Phosphoramidite | 10-3915-95 | 50 μ mole |
| | 10-3915-90 | 100 μ mole |
| | 10-3915-02 | 0.25g |



MINOR RNA (TBDMS PROTECTED) (CONT.)

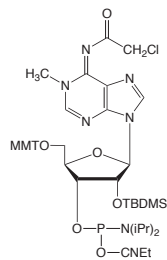
Methylation of adenosine at position 1 produces a drastic functional change in the nucleobase. 1-Methyladenosine (pK_a 8.25) is a much stronger base than adenosine (pK_a 3.5). N-1 methylation excludes participation of the adenine base in canonical Watson–Crick base pairing and provides a positive charge to the nucleobase. This modification also alters the hydrophobicity of the base, the stacking properties, the ordering of water molecules and the chelation properties. The base may become involved in non-canonical hydrogen bonding, in electrostatic interactions and, in general, it may contribute to the conformational dynamics of the tRNA.

In the central dogma of molecular biology, genetic information flows from DNA to RNA and then to protein. Reversible epigenetic modifications on genomic DNA and histone have been known to substantially regulate gene expression. On the other hand, there exists more than 100 naturally occurring chemical modifications in RNA; however, the functions of these RNA modifications are largely unknown. Whether some of these modifications in RNA can be reversed and could impact gene expression in the central dogma was unknown until the recent discovery of N6-methyladenosine (N6-Me-A) as the first example of reversible RNA methylation.¹ We offer the N6-Me-A RNA monomer with a phenoxyacetyl protecting group to minimize potential branching. We have shown N6-Me-A-CE Phosphoramidite to be completely compatible with all popular RNA synthesis and deprotection methods, from UltraMild to the most popular procedure using AMA for deprotection.

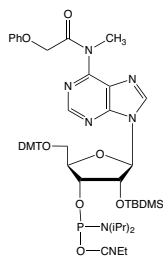
| Item | Catalog No. | Pack |
|----------------------------|-------------|----------------|
| 1-Me-A-CE Phosphoramidite | 10-3501-95 | 50 μ mole |
| | 10-3501-90 | 100 μ mole |
| | 10-3501-02 | 0.25g |
| N6-Me-A-CE Phosphoramidite | 10-3005-95 | 50 μ mole |
| | 10-3005-90 | 100 μ mole |
| | 10-3005-02 | 0.25g |

RNA methylation occurs in a large selection of RNA nucleosides and this post transcriptional modification of RNA, carried out by a variety of RNA methyltransferases, appears in a wide variety of RNA species - including tRNA, mRNA, miRNA and RNA viruses. Over 90 methylated nucleosides have been found in tRNA and these play many significant roles in tRNA structure. In addition, methylation appears to mark the tRNA as mature, preventing its degradation as well as directing localization within the cell. mRNA, modified with 1-methylpseudouridine (1-Me- Ψ) alone or in combination with 5-methylcytidine (5-Me-C), significantly increases protein expression in cells and mouse models. 1-Me- Ψ is also a modified nucleobase that can greatly enhance the properties of mRNA by reducing immunogenicity and increasing stability.

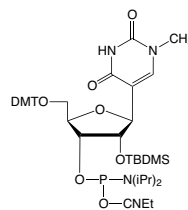
| Item | Catalog No. | Pack |
|------------------------------------|-------------|----------------|
| 1-Me-Pseudouridine Phosphoramidite | 10-3056-95 | 50 μ mole |
| | 10-3056-90 | 100 μ mole |
| | 10-3056-02 | 0.25g |



1-Me-A



N6-Me-A



1-Me-Pseudouridine

REFERENCE

- (1) Y. Fu, D. Dominissini, G. Rechavi, and C. He, *Nat Rev Genet*, 2014, **15**, 293-306.

RELATED

| | |
|--------------------|-----|
| 5-Me-C..... | 139 |
| Pseudouridine..... | 142 |

MINOR RNA (TBDMS PROTECTED) (CONT.)

REFERENCE

(1) Füchtbauer, A.E., Preus, S., Börjesson, K., McPhee, S.A., Lilley D.M.J., Wilhelmsson, L.M., *Sci. Rep.*, 2017, **7**, 2393.

INTELLECTUAL PROPERTY

These products are offered in collaboration with ModyBase HB.

RELATED

tC^o76
 Pyrrolo-dC74
 Pyrrolo-C140

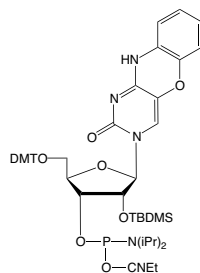
The bright fluorescent tricyclic cytosine analogues tC and tC^o stand out among fluorescent bases due to their virtually unquenched fluorescence inside single- or double-stranded DNA. Until recently, this family of tricyclic cytosines had only been studied and used in DNA contexts and, importantly, introduced as possible donors of the first DNA base analogue FRET-pair with tC_{nitro}. Fluorescent base analogues for RNA are limited in number compared to their DNA counterparts. To facilitate the application of such analogues, characterization of their structural and dynamics behavior in RNA compared to the corresponding natural nucleoside is important. We now introduce the tC^o ribonucleoside, which has been incorporated into a range of RNA sequences, where it was shown to be a very potent and useful fluorophore in this context.¹ Glen Research offers this useful fluorescent ribonucleoside analogue in cooperation with ModyBase HB.

| Item | Catalog No. | Pack |
|-----------------------------|-------------|-----------|
| Ribo-tCO-CE Phosphoramidite | 10-3517-95 | 50 μmole |
| | 10-3517-90 | 100 μmole |
| | 10-3517-02 | 0.25g |

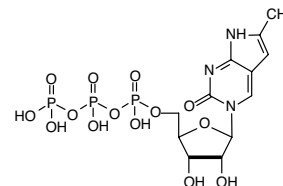
MINOR RNA TRIPHOSPHATES

Pyrrolo-dC is a fluorescent nucleoside that codes as dC and base pairs efficiently with dG. Preliminary evidence indicates that pyrrolo-dC triphosphate is an excellent substrate for Taq, Pfu and Vent polymerases and is incorporated specifically opposite dG. Pyrrolo-dCTP has been available for some time and is in use in biological assays. Pyrrolo-CTP is a fluorescent ribonucleotide with fluorescence exquisitely sensitive to its environment and is of great interest for RNA structural research. The pyrrolo-C project is a joint development by Berry and Associates, Inc. and Glen Research.

| Item | Catalog No. | Pack |
|---------------------|-------------|--------------|
| Pyrrolo-CTP 10mM | 81-3017-01 | Discontinued |



Ribo-tC^o



Pyrrolo-CTP

2'-OME-RNA PHOSPHoramidites

Glen Research 2'-OMe-RNA CE (β -cyanoethyl) Phosphoramidites are designed to produce synthetic oligonucleotides containing nuclease resistant 2'-O-methyl ribonucleotide linkages. Deprotection, isolation and handling of 2'-O-methyl oligonucleotides are identical to the procedures for oligodeoxynucleotides.

| Item | Catalog No. | Pack |
|---------------------------------|-------------|----------------|
| 2'-OMe-A-CE Phosphoramidite | 10-3100-90 | 100 μ mole |
| | 10-3100-02 | 0.25g |
| | 10-3100-05 | 0.5g |
| | 10-3100-10 | 1.0g |
| 2'-OMe-Ac-C-CE Phosphoramidite | 10-3115-90 | 100 μ mole |
| | 10-3115-02 | 0.25g |
| | 10-3115-05 | 0.5g |
| | 10-3115-10 | 1.0g |
| 2'-OMe-iBu-G-CE Phosphoramidite | 10-3120-90 | 100 μ mole |
| | 10-3120-02 | 0.25g |
| | 10-3120-05 | 0.5g |
| | 10-3120-10 | 1.0g |
| 2'-OMe-G-CE Phosphoramidite | 10-3121-90 | 100 μ mole |
| | 10-3121-02 | 0.25g |
| | 10-3121-05 | 0.5g |
| | 10-3121-10 | 1.0g |
| 2'-OMe-U-CE Phosphoramidite | 10-3130-90 | 100 μ mole |
| | 10-3130-02 | 0.25g |
| | 10-3130-05 | 0.5g |
| | 10-3130-10 | 1.0g |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

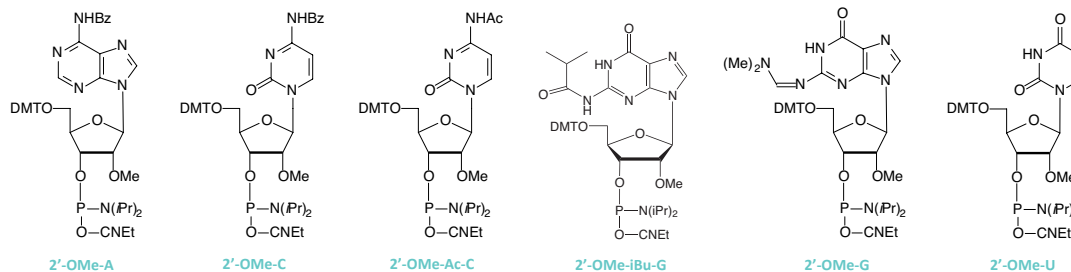
| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)



ULTRAMILD 2'-OME-RNA

The use of UltraMild monomers in oligonucleotide synthesis has allowed very sensitive dyes like TAMRA, HEX and Cy5 to be used virtually routinely. The DNA and RNA monomers are currently available and we also provide this set of 2'-OME-RNA monomers. In our version of this chemistry, we use as protecting groups phenoxyacetyl (Pac) for A, acetyl (Ac) for C, and isopropyl-phenoxyacetyl (iPr-Pac) for G.

It has become clear that acetic anhydride in the conventional capping mix can cause transamidation in situations where an amine protecting group is quite labile. This leads to acetyl protection on the amino group that may be slow to be removed. Consequently, if many dG residues are included in the oligonucleotide, we recommend the use of phenoxyacetic anhydride (Pac₂O) in Cap A. This modification removes the possibility of exchange of the iPr-Pac protecting group on the dG with acetate from the acetic anhydride capping mix.

| Item | Catalog No. | Pack |
|-------------------------------------|-------------|-------|
| 2'-OMe-Pac-A-CE Phosphoramidite | 10-3601-02 | 0.25g |
| | 10-3601-05 | 0.5g |
| | 10-3601-10 | 1.0g |
| 2'-OMe-Ac-C-CE Phosphoramidite | 10-3115-02 | 0.25g |
| | 10-3115-05 | 0.5g |
| | 10-3115-10 | 1.0g |
| 2'-OMe-iPr-Pac-G-CE Phosphoramidite | 10-3621-02 | 0.25g |
| | 10-3621-05 | 0.5g |
| | 10-3621-10 | 1.0g |

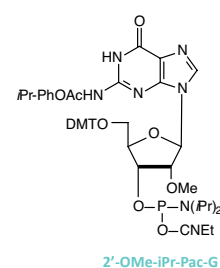
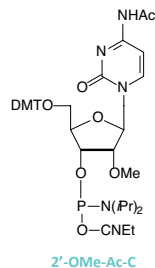
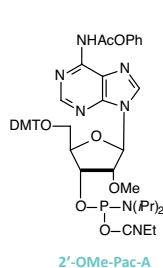
ULTRAMILD SOLVENTS/REAGENTS

Cap Mix A

THF/Pyridine/Pac₂O 40-4210-52 200mL
 (Applied Biosystems) 40-4210-57 450mL

THF/Pac₂O 40-4212-52 200mL
 (Expedite) 40-4212-57 450mL

Deprotection Solution
 0.05M Potassium Carbonate in Methanol 60-4600-30 30mL
 60-4600-52 200mL
 60-4600-57 450mL



2'-OME-RNA SUPPORTS

ABI-style columns are supplied for 1 μ mole and 0.2 μ mole scales unless otherwise requested (see note box).

| Item | Catalog No. | Pack |
|---------------------------------|------------------------|--------------|
| 2'-OMe-A-RNA-CPG | 20-3600-01 | 0.1g |
| | 20-3600-02 | 0.25g |
| | 20-3600-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3700-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3700-14 | Pack of 1 |
| 2'-OMe-C-RNA-CPG | 20-3610-01 | Discontinued |
| 2'-OMe-Ac-C-RNA-CPG | 20-3615-01 | 0.1g |
| | 20-3615-02 | 0.25g |
| | 20-3615-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3715-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3715-14 | Pack of 1 |
| 2'-OMe-G-RNA-CPG | 20-3621-01 | 0.1g |
| | 20-3621-02 | 0.25g |
| | 20-3621-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3721-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3721-14 | Pack of 1 |
| 2'-OMe-U-RNA-CPG | 20-3630-01 | 0.1g |
| | 20-3630-02 | 0.25g |
| | 20-3630-10 | 1.0g |
| | 1 μ mole columns | Pack of 4 |
| | 0.2 μ mole columns | Pack of 4 |
| 10 μ mole column (ABI) | 20-3730-13 | Pack of 1 |
| 15 μ mole column (Expedite) | 20-3730-14 | Pack of 1 |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type Add

Expedite E
MerMade M

Columns

For Instrument type Add

Expedite E
Applied Biosystems 3900 A
MerMade M

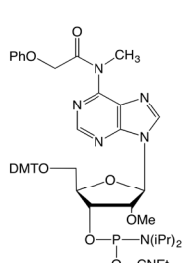
(Please inquire for availability of vials and columns for other instrument types.)

MINOR 2'-OME-RNA PHOSPHoramIDITES

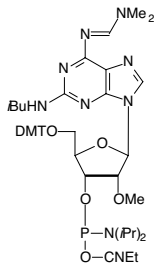
To aid in the evaluation of the structures of 2'-OME-RNA complexes, we offer the CE phosphoramidites listed below. 2'-OME-T is useful in triplex studies while the 2-aminopurine derivative may be tested in ribozyme studies. By supporting an additional hydrogen bond, 2,6-diaminopurine (2-amino-adenosine) binds more strongly with uridine than does adenosine. Oligonucleotides containing 2'-OME-5-Me-C and 2'-OME-I would be of interest to researchers involved in triplex and antisense studies using 2'-OME-RNA. The uses of 2'-OME-5-bromo-U phosphoramidite range from crystallographic studies due to the heavy atom to cross-linking because of its photolability. 5-Fluoro-pyrimidine nucleosides have been useful as therapeutic agents and their effect on the structure and activity of oligonucleotides may be examined using the 2'-OME-RNA derivatives.

ABI-style vials are supplied unless otherwise requested (see note box).

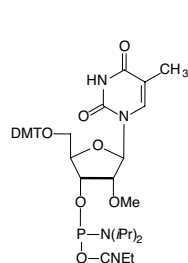
| Item | Catalog No. | Pack |
|---|-------------|----------------|
| 2'-OME-N6-Me-A-CE Phosphoramidite | 10-3105-95 | 50 μ mole |
| | 10-3105-90 | 100 μ mole |
| | 10-3105-02 | 0.25g |
| 2'-OME-2-Aminopurine-CE Phosphoramidite | 10-3123 | Discontinued |
| 2'-OME-2,6-Diaminopurine-CE Phosphoramidite (2-amino-A) | 10-3124-95 | 50 μ mole |
| | 10-3124-90 | 100 μ mole |
| | 10-3124-02 | 0.25g |
| 2'-OME-5-Me-U-CE Phosphoramidite (2'-OME-T) | 10-3131-90 | 100 μ mole |
| | 10-3131-02 | 0.25g |
| 2'-OME-I-CE Phosphoramidite | 10-3140-90 | 100 μ mole |
| | 10-3140-02 | 0.25g |
| 2'-OME-5-Me-C-CE Phosphoramidite | 10-3160-90 | 100 μ mole |
| | 10-3160-02 | 0.25g |
| 2'-OME-5-Br-U-CE Phosphoramidite | 10-3190-90 | 100 μ mole |
| | 10-3190-02 | 0.25g |
| 2'-OME-5-F-U-CE Phosphoramidite | 10-3132 | Discontinued |



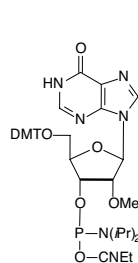
2'-OME-N6-Me-A



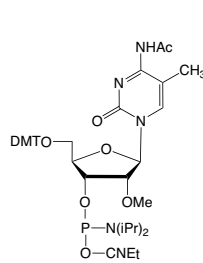
2'-OME-2-amino-A



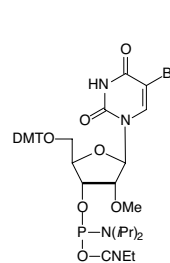
2'-OME-5-Me-U



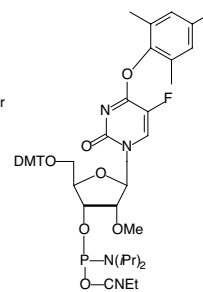
2'-OME-I



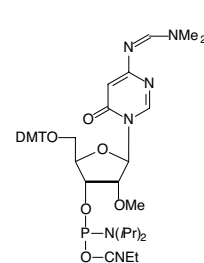
2'-OME-5-Me-C



2'-OME-5-Br-U



2'-OME-TMP-5-F-U



2'-OME-3-deaza-5-aza-C

2'-OME-THIOPHOSPHORAMIDITES

The phosphorodithioate linkage (PS2) is both achiral and essentially resistant to nucleases. Previous studies have shown very interesting results which include observations that DNA with PS2 linkages activates RNase H in vitro, strongly inhibits human immunodeficiency virus (HIV) reverse transcriptase, induces B-cell proliferation and differentiation, and is completely resistant to hydrolysis by various nucleases. 2'-Ome- RNA Thiophosphoramidites are RNA monomers designed to produce oligos combining the PS2 linkage with the 2'-O-methyl ribose modification. These PS2-modified RNA oligos have potential for use in siRNAs and dithiophosphate aptamers (thioaptamers).

| Item | Catalog No. | Pack |
|------------------------------|-------------|----------------|
| 2'-Ome-A-Thiophosphoramidite | 10-3170-90 | 100 μ mole |
| | 10-3170-02 | 0.25g |
| 2'-Ome-C-Thiophosphoramidite | 10-3171-90 | 100 μ mole |
| | 10-3171-02 | 0.25g |
| 2'-Ome-G-Thiophosphoramidite | 10-3172-90 | 100 μ mole |
| | 10-3172-02 | 0.25g |
| 2'-Ome-U-Thiophosphoramidite | 10-3173-90 | 100 μ mole |
| | 10-3173-02 | 0.25g |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

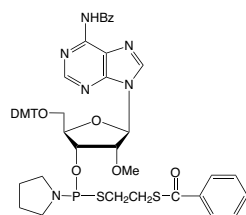
| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

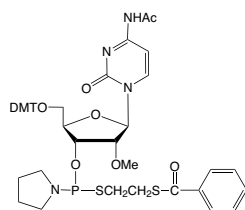
For Instrument type [Add](#)

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

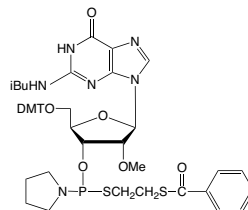
(Please inquire for availability of vials and columns for other instrument types.)



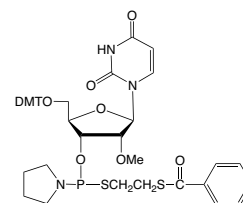
2'-Ome-A-Thiophosphoramidite



2'-Ome-C-Thiophosphoramidite



2'-Ome-G-Thiophosphoramidite



2'-Ome-U-Thiophosphoramidite

2'-MOE RNA PHOSPHORAMIDITES

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type [Add](#)

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns

For Instrument type [Add](#)

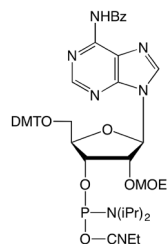
| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)

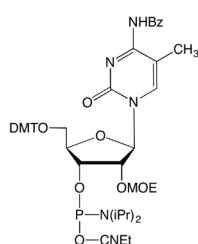
Like the very similar 2'-OMe backbone, the 2'-O-methoxyethyl-RNA (2'-MOE) backbone provides enhanced duplex stability, significant nuclease resistance and relatively low toxicity. As a result, 2'-MOE has been an attractive backbone for many therapeutic candidates, several of which have been approved by the FDA. These drugs have included 1) 2'-MOE/DNA chimeras to facilitate RNase H cleavage of target RNA sequences as well as 2) steric blocking oligonucleotides to alter the splicing of mRNA. The standard 2'-MOE nucleotides are A, 5-Me-C, G and 5-Me-U.

ABI-style vials are supplied unless otherwise requested (see note box).

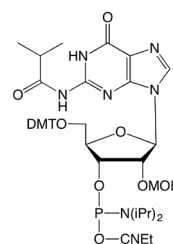
| Item | Catalog No. | Pack |
|-------------------------------|-------------|------|
| A-2'-MOE-Phosphoramidite | 10-3200-05 | 0.5g |
| | 10-3200-10 | 1.0g |
| | 10-3200-20 | 2.0g |
| 5-Me-C-2'-MOE-Phosphoramidite | 10-3211-05 | 0.5g |
| | 10-3211-10 | 1.0g |
| | 10-3211-20 | 2.0g |
| G-2'-MOE-Phosphoramidite | 10-3220-05 | 0.5g |
| | 10-3220-10 | 1.0g |
| | 10-3220-20 | 2.0g |
| 5-Me-U-2'-MOE-Phosphoramidite | 10-3231-05 | 0.5g |
| | 10-3231-10 | 1.0g |
| | 10-3231-20 | 2.0g |



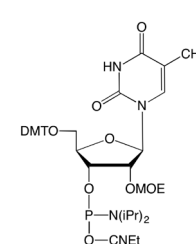
A-2'-MOE



5-Me-C-2'-MOE



G-2'-MOE



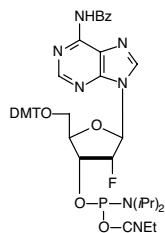
5-Me-U-2'-MOE

2'-F-RNA PHOSPHoramidites

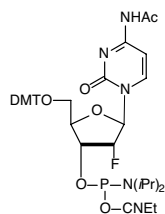
2'-Deoxy-2'-fluoro-nucleosides adopt an RNA-type sugar conformation, presumably due to the high electronegativity of fluorine. Because of this sugar conformation, RNA duplexes (A-form) are generally more thermodynamically stable than DNA duplexes (B-form). As expected, the addition of 2'-F-RNA residues to oligodeoxynucleotides progressively increases the thermal stability of their duplexes with RNA. The stabilization is additive at approximately 2° per residue. This compares favorably with 2'-OMe-RNA at around 1.5° and RNA at 1.1° per residue. In the meantime, base pair specificity remains intact.

2'-F-RNA phosphodiester linkages are not nuclease resistant, although the corresponding phosphorothioate linkages are highly resistant. Researchers usually design antisense oligonucleotides to form duplexes with RNA, which are then substrates for RNase H. Uniformly modified 2'-F-RNA/RNA duplexes are not substrates for RNase H. However, it is straightforward to prepare chimeric 2'-F-RNA/DNA phosphorothioate oligonucleotides which exhibit enhanced binding to the RNA target, are substrates for RNase H, and are highly nuclease resistant.

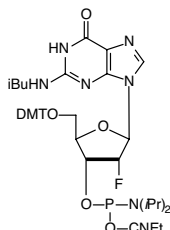
| Item | Catalog No. | Pack |
|------------------------------|-------------|-----------|
| 2'-F-A-CE Phosphoramidite | 10-3400-02 | 0.25g |
| | 10-3400-05 | 0.5g |
| 2'-F-Ac-C-CE Phosphoramidite | 10-3415-02 | 0.25g |
| | 10-3415-05 | 0.5g |
| 2'-F-G-CE Phosphoramidite | 10-3420-02 | 0.25g |
| | 10-3420-05 | 0.5g |
| 2'-F-U-CE Phosphoramidite | 10-3430-02 | 0.25g |
| | 10-3430-05 | 0.5g |
| 2'-F-I-CE Phosphoramidite | 10-3440-90 | 100 µmole |
| | 10-3440-02 | 0.25g |



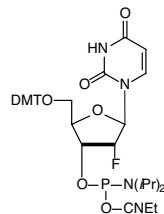
2'-F-A



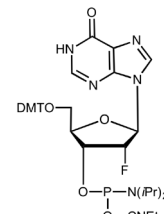
2'-F-Ac-C



2'-F-G



2'-F-U



2'-F-I

STABILITY NOTE

Synthetic oligonucleotides containing 2'-F-RNA linkages may be deprotected with ammonium hydroxide as normal. Deprotection using AMA at 65°C leads to some degradation and so we recommend the use of AMA at room temperature for 2 hours.

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

Monomers

For Instrument type

Add

Expedite

E

MerMade

M

Columns

For Instrument type

Add

Expedite

E

Applied Biosystems 3900

A

MerMade

M

(Please inquire for availability of vials and columns for other instrument types.)

2'-F-ARABINONUCLEIC ACID (2'-F-ANA)

REFERENCES

1. E. Viazovkina, M.M. Mangos, M.I. Elzagheid, and M.J. Damha, *Curr Protoc Nucleic Acid Chem*, 2002, **Chapter 4**, Unit 4 15.
2. J.K. Watts, and M.J. Damha, *Can. J. Chem.*, 2008, **86**, 641-656.
3. J.K. Watts, A. Katolik, J. Viladoms, and M.J. Damha, *Org Biolomol Chem*, 2009, **7**, 1904-10.
4. A. Kalota, *et al.*, *Nucleic Acids Res.*, 2006, **34**, 451.
5. G.F. Deleavey, *et al.*, *Nucleic Acids Res.*, 2010, **38**, 4547-4557, J.K. Watts, *et al.*, *Nucleic Acids Res.*, 2007, **35**, 1441-1451, T. Dowler, *et al.*, *Nucleic Acids Res.*, 2006, **34**, 1669-1675.

INTELLECTUAL PROPERTY

2'-F-ANA is covered by intellectual property. Key patents covering siRNA and antisense applications are as follows:

WO/2009/146556 (siRNA); WO 03064441 and WO 0220773 (antisense).

STABILITY NOTE

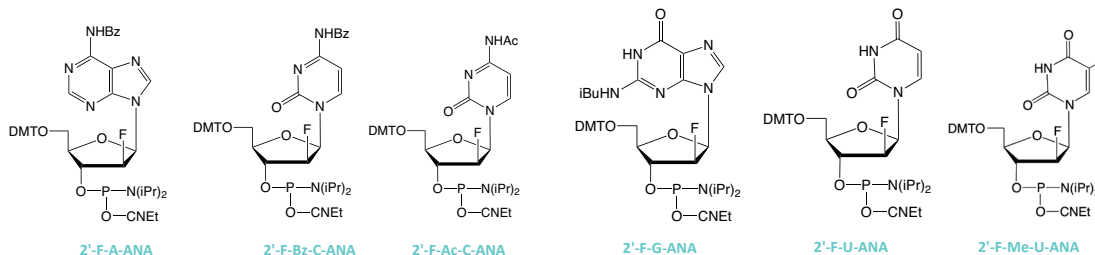
Synthetic oligonucleotides containing 2'-F-RNA linkages may be deprotected with ammonium hydroxide as normal. Deprotection using AMA at 65°C leads to some degradation and so we recommend the use of AMA at room temperature for 2 hours.

Arabinonucleosides are epimers of ribonucleosides with the chiral switch being at the 2' position of the sugar residue. 2'-F-ANA adopts a more DNA-like B-type helix conformation, not through the typical C2'-endo conformation but, rather, through an unusual O4'-endo (east) pucker. However, the presence of the electronegative fluorine leads to a still significant increase (ΔT_m 1.2 °C/mod) in melting temperature per modification.¹ 2'-F-ANA-containing oligonucleotides exhibit very high binding specificity to their targets. Indeed, a single mismatch in a 2'-F-ANA - RNA duplex leads to a ΔT_m of -7.2 °C and in a 2'-F-ANA - DNA duplex a ΔT_m of -3.9 °C.²

The presence of fluorine at the 2' position in 2'-F-ANA leads to increased stability to hydrolysis under basic conditions relative to RNA and even 2'-F-RNA.^{1,3} The stability of 2'-F-ANA to nucleases also makes this a useful modification for enhancing the stability of oligonucleotides in biological environments.² 2'-F-ANA hybridizes strongly to target RNA and, unlike most 2' modifications, induces cleavage of the target by RNase H. Phosphorothioate (PS) 2'-F-ANA is routinely used in these applications due to its increased nuclease resistance. Alternating 2'-F-ANA and DNA units provide among the highest potency RNase H-activating oligomers. Both the "altimer" and "gapmer" strand architectures consistently outperform PS-DNA and DNA/RNA gapmers.⁴

siRNA oligos were found to tolerate the presence of 2'-F-ANA linkages very well. High potency gene silencing was demonstrated⁵ with siRNA chimeras containing 2'-F-RNA and/or LNA and 2'-F-ANA. The high efficacy of these chimeras was attributed to the combination of the rigid RNA-like properties of 2'-F-RNA and LNA with the DNA-like properties of 2'-F-ANA.

| Item | Catalog No. | Pack |
|----------------------------------|--------------------------|-------------------------|
| 2'-F-A-ANA CE Phosphoramidite | 10-3800-90 10-3800-02 | 100 μ mole 0.25g |
| 2'-F-Bz-C-ANA CE Phosphoramidite | 10-3810 | Discontinued |
| 2'-F-Ac-C-ANA CE Phosphoramidite | 10-3815-02 10-3815-05 | 0.25g 0.5g |
| 2'-F-G-ANA CE Phosphoramidite | 10-3820-90 10-3820-02 | 100 μ mole 0.25g |
| 2'-F-U-ANA CE Phosphoramidite | 10-3830-02 10-3830-05 | 0.25g 0.5g |
| 2'-F-Me-U-ANA CE Phosphoramidite | 10-3850-02 10-3850-05 | 0.25g 0.5g |

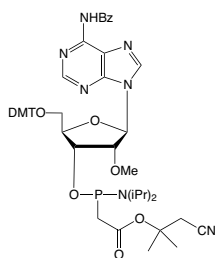


2'-OME-RNA-PACE PHOSPHoramIDITES

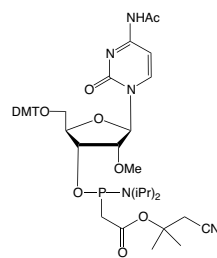
PACE modifications have enjoyed a resurgence in interest as applied to the field of CRISPR gene editing. In an initial publication, it was shown that single guide RNAs (sgRNA) provided significantly higher activity in cells when 2'-O-methylthiophosphonoacetates were incorporated on the ends of the guide RNA to protect against cellular nucleases.¹ In subsequent studies, 2'-OMe PACE modified sgRNAs were also shown to significantly increase on-target specificity of the CRISPR-Cas9 DNA cleavage in eukaryotic cells. In a recent paper, the incorporation of 2'-OMe PACE modified nucleotides in the 20-nucleotide guide region of the sgRNA was shown to decrease off-target cutting by over an order of magnitude while in most cases increasing the overall on-target efficiency as compared to unmodified single guide RNA.²

As an optimal cycle, we recommend using DCI as an activator (30-3150-XX) and a 15 minute coupling time. Following coupling, cap using Unicap (10-4410-XX) with a regular coupling time and then oxidize using 0.5 M CSO for 3 minutes. Alternatively, a 33 minute coupling time using 0.45 M tetrazole, oxidation using low-water iodine (40-4032-XX) followed by capping with 6.5% DMAP as Cap B will give acceptable results. For deprotection, pre-treat the synthesis column with 1.5% DBU in anhydrous acetonitrile for 60 minutes at room temperature to remove 1,1-dimethyl-2-cyanoethyl protecting groups. Rinse the column with acetonitrile, dry under argon and complete the deprotection with 40% aqueous methylamine for 2 hours at room temperature.

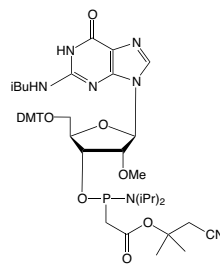
| Item | Catalog No. | Pack |
|----------------------------------|-------------|--------------|
| 2'-OMe-A-PACE Phosphoramidite | 10-3150 | Discontinued |
| 2'-OMe-Ac-C-PACE Phosphoramidite | 10-3151 | Discontinued |
| 2'-OMe-G-PACE Phosphoramidite | 10-3152 | Discontinued |
| 2'-OMe-U-PACE Phosphoramidite | 10-3153 | Discontinued |



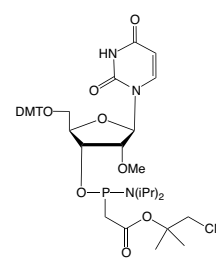
2'-OMe-A-PACE



2'-OMe-Ac-C-PACE



2'-OMe-G-PACE



2'-OMe-U-PACE

REFERENCES

1. A. Hendel, *et al.*, *Nat Biotechnol*, 2015, **33**, 985-989.
2. D.E. Ryan, *et al.*, *Nucleic Acids Res*, 2018, **46**, 792-803.

INTELLECTUAL PROPERTY

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A simple agreement must be signed before end-users and custom oligo services may purchase these products for use as defined above.
https://www.glenresearch.com/media/productattach/import/technical_note/PACE.pdf

RELATED

| | |
|----------------|----|
| DNA PACE | 41 |
| DCI | 34 |
| Unicap | 36 |
| 0.5M CSO | 36 |

GLEN-PAK™ PURIFICATION

Glen-Pak™ cartridges have advantages over Poly-Pak cartridges in that a single loading of the diluted crude deprotection solution is all that is necessary. Also, the range of purification has been extended to 100+ using DMT-ON oligos. In addition, Glen-Pak cartridges allow purification of virtually the complete range of dyes and modifiers.

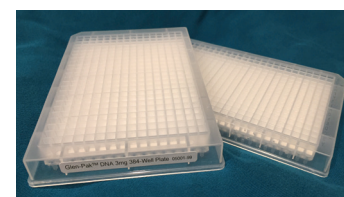
The Glen-Pak Cartridge 3g is a large cartridge capable of purifying 10-20 μmole oligonucleotide syntheses using the standard DMT-ON procedure and Glen-Pak 30mg 96-Well Plates are for parallel purification of up to 50 nmole scale syntheses. The Glen-Pak 3mg 384-Well Plate is designed for use with 384-well plate compatible vacuum manifold systems and can purify up to a 20 nmole scale synthesis. Each well contains 3mg of Glen-Pak resin, which binds about 15 nmoles of full length 40-mer DMT-ON oligo.

Scale suggestions for the Glen-Pak product line are shown below:

| Glen-Pak DNA Product | Catalog Number | Synthesis Scale Compatibility |
|--------------------------------------|---------------------------|-------------------------------|
| Glen-Pak 50mg Purification Cartridge | 60-5000-96 | 10 nmole – 200 nmole |
| Glen-Pak Purification Cartridge | 60-5100-XX and 60-5200-XX | 10 nmole – 1.0 μmole |
| Glen-Pak Cartridge 3G | 60-5300-01 | 5 μmole – 20 μmole |
| Glen-Pak 30mg 96-Well Plate | 60-5400-01 | 10 nmole – 50 nmole |
| Glen-Pak 3mg 384-Well Plate | 60-5500-XX | Up to 20 nmole |

A User Guide to *Glen-Pak™ Purification* describes in detail the process and several applications for DNA and RNA purification. This booklet is available online at: https://www.glenresearch.com/media/productattach/g/l/glen-pak_2.9_1.pdf.

| Item | Catalog No. | Pack |
|--|-------------|------------|
| <i>Purification Cartridges</i> | | |
| Glen-Pak™ 50mg Purification Cartridge (For use in vacuum manifolds) | 60-5000-96 | Pack of 96 |
| Glen-Pak™ Purification Cartridge (For use in vacuum manifolds and high-throughput devices) | 60-5100-10 | Pack of 10 |
| | 60-5100-30 | Pack of 30 |
| | 60-5100-96 | Pack of 96 |
| Glen-Pak™ Purification Cartridge (For use with disposable syringes) | 60-5200-01 | Pack of 1 |
| | 60-5200-10 | Pack of 10 |
| Glen-Pak™ Cartridge 3g | 60-5300-01 | Pack of 1 |
| | 60-5300-05 | Pack of 5 |
| | 60-5300-10 | Pack of 10 |
| | 60-5300-20 | Pack of 20 |
| Glen-Pak™ 30mg 96-Well Plate | 60-5400-01 | Pack of 1 |
| Glen-Pak™ 3mg 384-Well Plate | 60-5500-01 | Pack of 1 |
| | 60-5500-10 | Pack of 10 |



RELATED
Poly-Pak Reagents..... 157

GLEN-PAK™ PURIFICATION (CONT.)

Reagents

| | | |
|----------------------|------------|-------|
| RNA Quenching Buffer | 60-4120-82 | 250mL |
| | 60-4120-80 | 1L |

Racks and Seals

| | | |
|-----------------------------------|------------|------|
| Adapter Rack | 60-0010-01 | each |
| (For use with 96 well manifolds) | | |
| Seal for Adapter Rack | 60-0020-01 | each |
| (For use on 96 well adapter rack) | | |

Please note, all Glen-Pak™ RNA Purification products have been discontinued. Contact Glen technical services for more detail

| Item | Catalog No. | Pack |
|---|-------------|--------------|
| <i>RNA Purification Cartridges</i> | | |
| Glen-Pak™ RNA Purification Cartridge | 60-6100 | Discontinued |
| (For use in vacuum manifolds and high-throughput devices) | | |
| Glen-Pak™ RNA Purification Cartridge | 60-6200 | Discontinued |
| (For use with disposable syringes) | | |

POLY-PAK™ PURIFICATION

The use of Poly-Pak™ packings in cartridges or barrels overcomes several disadvantages usually associated with reverse phase (RP) cartridges. The packing is stable in the pH range 1-13, thus the ammonium hydroxide solution, diluted with water, is loaded directly onto the packing. Also, after elution of failure sequences, the trityl group is removed and washed from the support-bound oligonucleotide. The fully deprotected product can then be eluted and isolated by lyophilization. Poly-Pak™ Cartridges may also be used for desalting normal or labeled oligonucleotides. The original Poly-Pak cartridge and barrel are designed for 0.2 μmole syntheses or less. Poly-Pak II cartridges and barrels are designed for use with 1 μmole syntheses. A booklet, User Guide To Poly-Pak™ Cartridge Purification, describes in detail the process and several applications. This booklet is available online at: <https://www.glenresearch.com/media/productattach/import/tbn/PolyPakBooklet.pdf>

Please note, all products for Poly-Pak purification have been discontinued. Contact Glen technical services for more detail.

| Item | Catalog No. | Pack |
|---|-------------|--------------|
| <i>Packing, Cartridges and Barrels</i> | | |
| Poly-Pak™ Packing | 60-1000 | Discontinued |
| Poly-Pak™ Cartridge | 60-1100 | Discontinued |
| Poly-Pak™ II Cartridge | 60-3100 | Discontinued |
| <i>Reagents</i> | | |
| 2.0M Triethylamine Acetate (TEAA) HPLC Grade | 60-4110-52 | 200mL |
| | 60-4110-57 | 450mL |
| | 60-4110-60 | 960mL |
| | 60-4110-62 | 2L |
| 2.0M Hexylammonium Acetate (HAA), HPLC Grade, pH=7 | 60-4210-52 | 200mL |
| | 60-4210-57 | 450mL |
| 2% Aqueous Trifluoroacetic Acid | 60-4040-57 | 450mL |



Poly-Pak Cartridge Used Manually

GLEN GEL-PAK™ DESALTING

The principle of the Glen Research gel filtration column, Glen Gel-Pak™, is based on size exclusion chromatography that separates molecules according to the hydrodynamic volume of the molecule in aqueous solutions. In gel filtration, the mobile phase for size exclusion is an aqueous solution and the stationary phase is a porous resin. The pores of the resin are sized such that they allow small molecules to enter the pores, yet exclude larger molecules from the pores. The small molecules, such as salts and hydrolyzed protecting groups, diffuse into the pores of the resin and move slowly through the column. The larger molecules, such as DNA or proteins, are excluded from the pores and move quickly through the column. The end result is that the larger molecules elute first in the column void volume while the small molecules are still flowing through the resin of the column.

Glen Gel-Pak columns are ideal for desalting and reaction clean up. They can be used for removal of the ammonium hydroxide deprotection solution and hydrolyzed protecting groups after deprotection. The columns can also be used for the clean up of NHS-labeling reactions to separate the labeled oligo and unlabeled oligo from the unreacted NHS ester, the hydrolyzed label, and n-hydroxysuccinimide, thereby greatly simplifying the downstream purification steps.

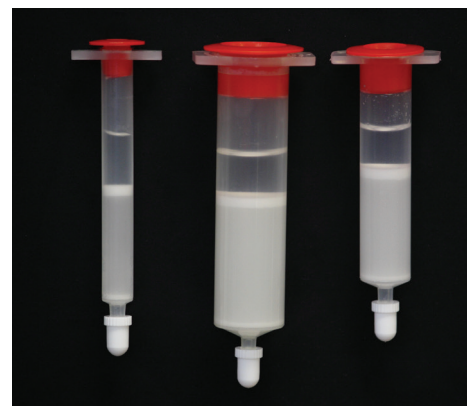
There are many benefits to Glen Gel-Pak columns:

Versatility:

- Ability to directly desalt oligonucleotides deprotected in either 30% ammonium hydroxide OR 50:50 ammonium hydroxide/40% aqueous methylamine (AMA)
- Easily exchange buffers
- Simple clean-up of labeling reactions
- Mild method for purification from salts and solvents such as DMSO and DMF

Capacity:

- Multiple column sizes (0.2 mL, 1.0 mL and 2.5 mL) are available to match synthesis scale
- Ability to efficiently desalt short and long oligos at different scales using the same protocol
- Suitable for oligos >10mer in length



Glen Gel-Pak 0.2 Glen Gel-Pak 2.5 Glen Gel-Pak 1.0

| Item | Catalog No. | Pack |
|---|-------------|------------|
| Glen Gel-Pak™ 0.2 Desalting Column (0.2 mL Capacity) | 61-5002-05 | Pack of 5 |
| Glen Gel-Pak™ 1.0 Desalting Column (1.0 mL Capacity) | 61-5010-05 | Pack of 5 |
| Glen Gel-Pak™ 2.5 Desalting Column (2.5 mL Capacity) | 61-5025-05 | Pack of 5 |
| | 61-5025-25 | Pack of 25 |

OLIGO-AFFINITY SUPPORT

Oligo-affinity supports (OAS) should ideally be compatible with automated synthesis, should be non-friable, should not shrink or swell, and should have low non-specific binding of the proteins or DNA. On the support shown below is an Adenosine residue attached through the exocyclic amino group. In this way, synthesis progresses regularly on removal of the 5'-DMT group. However, on treatment with ammonium hydroxide, the oligo is not cleaved from the support. This matrix can then be used as an affinity support for a complementary segment of DNA or RNA. Alternatively, the complementary strand can be annealed to the support and the double stranded DNA can be used as an affinity support for purifying DNA binding proteins.

We expect that OAS PS will be used for purification of components from biological fluids.

| Item | Catalog No. | Pack |
|---|-------------|-----------|
| Oligo-Affinity Support (PS) (OAS PS) | 26-4001-01 | 0.1g |
| | 26-4001-02 | 0.25g |
| | 26-4001-10 | 1.0g |
| Oligo-Affinity Support (PS) 1 μ mole TWIST columns | 26-4101-41 | Pack of 4 |

TRIS-BORATE-EDTA (TBE) BUFFER

Tris-Borate-EDTA (TBE) buffer is a popular running buffer for various applications, including agarose and polyacrylamide gel electrophoresis. This is often used for oligonucleotide purification and analysis. The formulation is provided at a concentration that can be diluted five-fold to give a ready-to-use (1X) 89 mM Tris Borate and 2.0 mM EDTA at pH 8.3.

| Item | Catalog No. | Pack |
|-------------------------------|-------------|------|
| Tris-Borate-EDTA (TBE) buffer | 60-4130-80 | 1L |

OTHER INSTRUMENT TYPES

All minor bases, RNA products and modifiers are packaged in septum-capped vials suitable for ABI and other instruments. If you would like another type of vial/column add the following to the end of the catalog number.

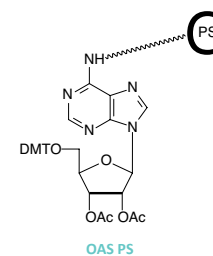
Monomers
For Instrument type *Add*

| | |
|----------|---|
| Expedite | E |
| MerMade | M |

Columns
For Instrument type *Add*

| | |
|-------------------------|---|
| Expedite | E |
| Applied Biosystems 3900 | A |
| MerMade | M |

(Please inquire for availability of vials and columns for other instrument types.)



PHYSICAL DATA

The physical data table contains information which is unique to each monomer phosphoramidite. The molecular weight (MW) is the formula weight of the fully-protected monomer phosphoramidite. The MW is used to calculate the volume of solvent required to dilute 0.25g of the monomer to give a final 0.1M concentration. This figure is also shown in the table. The unit molecular weight (Unit FW) is the formula weight of each monomer once inserted into an oligonucleotide with all protecting groups removed. To obtain the molecular weight of a specific oligonucleotide, the following formula is used: Oligonucleotide MW = Sum of Unit FW - 61.96

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|--|--------------------|---------|-----------------|
| 10-0001 | dA-5'-CE Phosphoramidite | 857.95 | 313.21 | 0.25g/2.91mL |
| 10-0101 | dC-5'-CE Phosphoramidite | 833.93 | 289.18 | 0.25g/3.00mL |
| 10-0301 | dT-5'-CE Phosphoramidite | 744.83 | 304.2 | 0.25g/3.36mL |
| 10-1000 | dA-CE Phosphoramidite | 857.95 | 313.21 | 0.25g/2.91mL |
| 10-1001 | 7-Deaza-dA-CE Phosphoramidite | 856.96 | 312.22 | 0.25g/2.92mL |
| 10-1003 | N6-Me-dA-CE Phosphoramidite | 767.86 | 327.24 | 0.25g/3.26mL |
| 10-1004 | 3'-dA-CE Phosphoramidite | 857.95 | 313.21 | 0.25g/2.91mL |
| 10-1006 | Etheno-dA-CE Phosphoramidite | 777.86 | 337.23 | 0.25g/3.21mL |
| 10-1007 | 8-Br-dA-CE Phosphoramidite | 887.81 | 392.11 | 0.25g/2.82mL |
| 10-1008 | 8-oxo-dA-CE Phosphoramidite | 873.95 | 329.21 | 0.25g/2.86mL |
| 10-1010 | dC-CE Phosphoramidite | 833.93 | 289.18 | 0.25g/3.00mL |
| 10-1014 | pdC-CE Phosphoramidite | 907.1 | 327.23 | 0.25g/2.76mL |
| 10-1015 | Ac-dC-CE Phosphoramidite | 771.85 | 289.18 | 0.25g/3.24mL |
| 10-1016 | TMP-F-dU-CE Phosphoramidite | 866.97 | 307.18 | 0.25g/2.88mL |
| 10-1017 | Pyrrolo-dC-CE Phosphoramidite | 767.85 | 327.23 | 0.25g/3.26mL |
| 10-1018 | 5-Me-dC Brancher Phosphoramidite | 942.1 | 402.36 | 0.25g/2.65mL |
| 10-1019 | Amino-Modifier C6 dC | 1049.14 | 457.42 | 0.25g/2.38mL |
| 10-1020 | dG-CE Phosphoramidite | 839.92 | 329.21 | 0.25g/2.98mL |
| 10-1021 | 7-deaza-dG-CE Phosphoramidite | 823.93 | 328.22 | 0.25g/3.03mL |
| 10-1027 | 8-Br-dG-CE Phosphoramidite | 903.9 | 408.1 | 0.25g/2.77mL |
| 10-1028 | 8-oxo-dG-CE Phosphoramidite | 855.93 | 345.21 | 0.25g/2.92mL |
| 10-1029 | dmf-dG-CE Phosphoramidite | 824.92 | 329.21 | 0.25g/3.03mL |
| 10-1030 | dT-CE Phosphoramidite | 744.83 | 304.2 | 0.25g/3.36mL |
| 10-1031 | 5'-OMe-dT-CE Phosphoramidite | 456.48 | 318.22 | 0.25g/5.48mL |
| 10-1032 | O4-Me-dT-CE Phosphoramidite | 758.85 | 318.22 | 0.25g/3.29mL |
| 10-1034 | 4-Thio-dT-CE Phosphoramidite | 813.95 | 320.26 | 0.25g/3.07mL |
| 10-1035 | Carboxy-dT | 814.88 | 360.22 | 0.25g/3.07mL |
| 10-1036 | 2-Thio-dT-CE Phosphoramidite | 879.02 | 320.26 | 0.25g/2.84mL |
| 10-1037 | Amino-Modifier C2 dT | 938.94 | 402.3 | 0.25g/2.66mL |
| 10-1038 | Biotin-dT | 1285.55 | 684.7 | 0.25g/1.94mL |
| 10-1039 | Amino-Modifier C6 dT | 995.05 | 458.41 | 0.25g/2.51mL |
| 10-1040 | dI-CE Phosphoramidite | 754.79 | 314.19 | 0.25g/3.31mL |
| 10-1041 | 2'-DeoxyNebularine-CE Phosphoramidite (Purine) | 738.82 | 298.19 | 0.25g/3.38mL |
| 10-1042 | O6-Phenyl-dI-CE Phosphoramidite | 830.92 | Varies | 0.25g/3.01mL |
| 10-1044 | 5-Nitroindole-CE Phosphoramidite | 780.86 | 340.23 | 0.25g/3.20mL |
| 10-1046 | 2-Aminopurine-CE Phosphoramidite | 809.01 | 313.21 | 0.25g/3.09mL |
| 10-1047 | dP-CE Phosphoramidite | 771.85 | 330.23 | 0.25g/3.24mL |
| 10-1048 | dK-CE Phosphoramidite | 853.96 | 358.25 | 0.25g/2.93mL |
| 10-1050 | dU-CE Phosphoramidite | 730.8 | 290.17 | 0.25g/3.42mL |
| 10-1051 | O4-Triazolyl-dU-CE Phosphoramidite | 781.84 | varies | 0.25g/3.20mL |
| 10-1052 | 4-Thio-dU-CE Phosphoramidite | 799.93 | 306.23 | 0.25g/3.13mL |
| 10-1053 | 5-OH-dU-CE Phosphoramidite | 788.83 | 306.17 | 0.25g/3.17mL |

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|--|--------------------|--------------------------|-----------------|
| 10-1054 | pdU-CE Phosphoramidite | 768.85 | 328.22 | 0.25g/3.25mL |
| 10-1055 | 2'-deoxypseudoU-CE Phosphoramidite | 730.8 | 290.17 | 0.25g/3.42mL |
| 10-1056 | Fluorescein-dT Phosphoramidite | 1425.57 | 815.71 | 0.25g/1.75mL |
| 10-1057 | TAMRA-dT | 1311.48 | 870.85 | 0.25g/1.91mL |
| 10-1058 | Dabcyl-dT | 1150.32 | 709.7 | 0.25g/2.17mL |
| 10-1059 | EDTA-C2-dT-CE Phosphoramidite | 1201.32 | 676.53 | 0.25g/2.08mL |
| 10-1060 | 5-Me-dC-CE Phosphoramidite | 847.9 | 303.21 | 0.25g/2.95mL |
| 10-1061 | 5-Me-2'-deoxyZebularine-CE Phosphoramidite | 728.82 | 288.19 | 0.25g/3.43mL |
| 10-1062 | 5-Hydroxymethyl-dC-CE Phosphoramidite | 917 | 319.21 | 0.25g/2.73mL |
| 10-1063 | 5-OH-dC-CE Phosphoramidite | 954.03 | 305.18 | 0.25g/2.62mL |
| 10-1064 | 3'-dC-CE Phosphoramidite | 833.92 | 289.18 | 0.25g/3.00mL |
| 10-1065 | dmf-5-Me-isodC-CE Phosphoramidite | 798.91 | 303.21 | 0.25g/3.13mL |
| 10-1066 | 5-Carboxy-dC-CE Phosphoramidite | 905.97 | 333.19 | 0.25g/2.76mL |
| 10-1068 | N4-Et-dC-CE Phosphoramidite | 757.87 | 317.42 | 0.25g/3.30mL |
| 10-1070 | O6-Me-dG-CE Phosphoramidite | 853.97 | 343.24 | 0.25g/2.93mL |
| 10-1072 | 6-thio-dG-CE Phosphoramidite | 934.97 | 345.26 | 0.25g/2.67mL |
| 10-1073 | 7-Deaza-8-aza-dG-CE Phosphoramidite (PPG) | 824.91 | 329.2 | 0.25g/3.03mL |
| 10-1074 | 3'-dG-CE Phosphoramidite | 824.92 | 329.21 | 0.25g/3.03mL |
| 10-1076 | 7-deaza-dX-CE Phosphoramidite | 769.83 | 329.21 | 0.25g/3.25mL |
| 10-1078 | dmf-isodG-CE Phosphoramidite | 1020.13 | 329.21 | 0.25g/2.45mL |
| 10-1079 | 8-Amino-dG-CE Phosphoramidite | 895.01 | 344.22 | 0.25g/2.79mL |
| 10-1080 | 5-Br-dC-CE Phosphoramidite | 912.82 | 368.08 | 0.25g/2.74mL |
| 10-1081 | 5-I-dC-CE Phosphoramidite | 959.83 | 415.08 | 0.25g/2.60mL |
| 10-1082 | 2-F-dI-CE Phosphoramidite | 921.96 | varies, 2F=332.18 | 0.25g/2.71mL |
| 10-1083 | 7-deaza-8-aza-dA-CE Phosphoramidite | 808.91 | 313.2 | 0.25g/3.09mL |
| 10-1084 | 3'-dT-CE Phosphoramidite | 744.83 | 304.2 | 0.25g/3.36mL |
| 10-1085 | 2-Amino-dA-CE Phosphoramidite | 1047.33 | 328.22 | 0.25g/2.39mL |
| 10-1086 | 8-Amino-dA-CE Phosphoramidite | 879.01 | 328.22 | 0.25g/2.84mL |
| 10-1088 | 3-deaza-dA-CE Phosphoramidite | 856.95 | 312.22 | 0.25g/2.92mL |
| 10-1089 | Amino-Modifier C6 dA | 1068.14 | 427.4 | 0.25g/2.34mL |
| 10-1090 | 5-Br-dU-CE Phosphoramidite | 809.69 | 369.07 | 0.25g/3.09mL |
| 10-1091 | 5-I-dU-CE Phosphoramidite | 856.69 | 416.07 | 0.25g/2.92mL |
| 10-1092 | 5-F-dU-CE Phosphoramidite | 748.79 | 308.16 | 0.25g/3.34mL |
| 10-1093 | 5-Hydroxymethyl-dU-CE Phosphoramidite | 802.86 | 320.19 | 0.25g/3.11mL |
| 10-1096 | Thymidine Glycol CE Phosphoramidite | 1007.36 | 338.21 | 0.25g/2.48mL |
| 10-1097 | AP-dC-CE Phosphoramidite | 974.97 | 438.33 | 0.25g/2.56mL |
| 10-1098 | 8,5'-Cyclo-dA CE Phosphoramidite | 855.92 | 311.19 | 0.25g/2.92mL |
| 10-1100 | dA-Me Phosponamidite | 802.91 | 311.24 | 0.25g/3.11mL |
| 10-1115 | Ac-dC-Me Phosponamidite | 716.81 | 287.21 | 0.25g/3.49mL |
| 10-1120 | dG-Me Phosponamidite | 784.89 | 327.24 | 0.25g/3.19mL |
| 10-1130 | dT-Me Phosponamidite | 689.79 | 302.23 | 0.25g/3.62mL |
| 10-1140 | dA-PACE Phosphoramidite | 928.02 | 354.24 | 0.25g/2.69mL |
| 10-1150 | Ac-dC-PACE Phosphoramidite | 841.93 | 330.21 | 0.25g/2.97mL |
| 10-1160 | dG-PACE Phosphoramidite | 910.01 | 370.24 | 0.25g/2.75mL |
| 10-1170 | dT-PACE Phosphoramidite | 814.9 | 345.22 | 0.25g/3.07mL |
| 10-1200 | dA-H-Phosphonate, TEA Salt | 822.9 | 313.21 | 0.25g/3.04mL |
| 10-1210 | dC-H-Phosphonate, DBU Salt | 849.35 | 289.18 | 0.25g/2.94mL |
| 10-1220 | dG-H-Phosphonate, TEA Salt | 804.88 | 329.21 | 0.25g/3.11mL |
| 10-1230 | dT-H-Phosphonate, TEA Salt | 709.78 | 304.2 | 0.25g/3.52mL |
| 10-1301 | Pac-dA-Me Phosphoramidite | 848.93 | 327.23 (Methyl triester) | 0.25g/2.94mL |
| 10-1315 | Ac-dC-Me Phosphoramidite | 732.81 | 303.21 (Methyl triester) | 0.25g/3.41mL |

PHYSICAL DATA

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|--|--------------------|-----------------------------------|-----------------|
| 10-1321 | iPr-Pac-dG-Me Phosphoramidite | 907.01 | 343.23 (Methyl triester) | 0.25g/2.76mL |
| 10-1330 | dT-Me Phosphoramidite | 705.79 | 318.22 (Methyl triester) | 0.25g/3.54mL |
| 10-1440 | CleanAmp™-Pac-dA-CE Phosphoramidite | 1045.25 | 523.56 (triester) | 0.25g/2.39mL |
| 10-1450 | CleanAmp™-Ac-dC-CE Phosphoramidite | 929.13 | 499.54 (triester) | 0.25g/2.69mL |
| 10-1460 | CleanAmp™-Pac-dG-CE Phosphoramidite | 1061.25 | 539.56 (triester) | 0.25g/2.36mL |
| 10-1470 | CleanAmp™-dT-CE Phosphoramidite | 902.11 | 514.55 (triester) | 0.25g/2.77mL |
| 10-1501 | 1-Me-dA-CE Phosphoramidite | 814.31 | 328.24 | 0.25g/3.07mL |
| 10-1503 | N6-Ac-N6-Me-dA-CE Phosphoramidite | 809.89 | 327.23 | 0.25g/3.09mL |
| 10-1504 | def-dA-CE Phosphoramidite | 836.97 | 313.21 | 0.25g/2.99mL |
| 10-1510 | 5-Hydroxymethyl-dC II-CE Phosphoramidite | 785.82 | 319.21 | 0.25g/3.18mL |
| 10-1511 | 5-aza-5,6-dihydro-dC-CE Phosphoramidite | 787.89 | 292.18 | 0.25g/3.17mL |
| 10-1513 | N4-Ac-N4-Et-dC-CE Phosphoramidite | 799.89 | 317.24 | 0.25g/3.13mL |
| 10-1514 | 5-Formyl-dC-CE Phosphoramidite | 915.96 | 317.19 (formyl) 349.23 (diol) | 0.25g/2.73mL |
| 10-1516 | tC-CE Phosphoramidite | 835.95 | 395.33 | 0.25g/2.99mL |
| 10-1517 | tCO-CE Phosphoramidite | 819.88 | 379.26 | 0.25g/3.05mL |
| 10-1518 | tCnitro-CE Phosphoramidite | 880.94 | 440.32 | 0.25g/2.84mL |
| 10-1527 | dW-CE Phosphoramidite | 992.30 | 311.23 | 0.25g/2.52mL |
| 10-1529 | N2-Amino-Modifier C6 dG | 965.01 | 428.38 | 0.25g/2.59mL |
| 10-1530 | 5,6-Dihydro-dT-CE Phosphoramidite | 746.84 | 306.21 | 0.25g/3.35mL |
| 10-1531 | N3-Cyanoethyl-dT | 797.88 | 357.26 | 0.25g/3.13mL |
| 10-1532 | 5'-Dabsyl-dT-CE Phosphoramidite | 729.78 | 591.53 | 0.25g/3.43mL |
| 10-1533 | DEACM Caged-dG-CE Phosphoramidite | 1175.31 | 558.49 (DEACM-dG) 329.21 (dG) | 0.25g/2.13mL |
| 10-1534 | N-POM Caged-dT-CE Phosphoramidite | 967.99 | 527.38 (N-POM-dT) | 0.25g/2.58mL |
| 10-1535 | NHS-Carboxy-dT | 897.91 | varies, -CO ₂ H=360.22 | 0.25g/2.78mL |
| 10-1536 | Fmoc Amino-Modifier C6 dT | 1121.28 | 458.41(NH ₂) | 0.25g/2.23mL |
| 10-1537 | dX-CE Phosphoramidite | 1069.1 | 330.19 | 0.25g/2.34mL |
| 10-1538 | S-Bz-Thiol-Modifier C6-dT | 1091.26 | 546.53 | 0.25g/2.29mL |
| 10-1539 | DBCO-dT-CE Phosphoramidite | 1214.57 | 773.77 | 0.25g/2.06mL |
| 10-1540 | C8-Alkyne-dT-CE Phosphoramidite | 834.94 | 394.32 | 0.25g/2.99mL |
| 10-1541 | C8-TIPS-Alkyne-dC-CE Phosphoramidite | 1094.4 | 393.33 | 0.25g/2.28mL |
| 10-1542 | C8-TMS-Alkyne-dC-CE Phosphoramidite | 1010.24 | 393.33 | 0.25g/2.47mL |
| 10-1543 | C8-Alkyne-dC-CE Phosphoramidite | 938.06 | 393.33 | 0.25g/2.67mL |
| 10-1544 | C8-TIPS-Alkyne-dT-CE Phosphoramidite | 991.28 | 394.32 | 0.25g/2.52mL |
| 10-1545 | C8-TMS-Alkyne-dT-CE Phosphoramidite | 907.12 | 394.32 | 0.25g/2.76mL |
| 10-1550 | 5,6-Dihydro-dU-CE Phosphoramidite | 732.81 | 292.19 | 0.25g/3.41mL |
| 10-1554 | 5-Ethynyl-dU-CE Phosphoramidite | 754.81 | 314.19 | 0.25g/3.31mL |
| 10-1555 | TIPS-5-Ethynyl-dU-CE Phosphoramidite | 911.15 | 314.19 | 0.25g/2.74mL |
| 10-1560 | Ac-5-Me-dC-CE Phosphoramidite | 785.86 | 303.21 | 0.25g/3.18mL |
| 10-1564 | 5-Formyl dC III CE Phosphoramidite | 950.02 | 317.19 375.27 (acetal) | 0.25g/2.63mL |
| 10-1576 | Ferrocene-dT-CE Phosphoramidite | 1125.07 | 684.45 | 0.25g/2.22mL |
| 10-1585 | Pac-2-Amino-dA-CE Phosphoramidite | 1042.21 | 328.22 | 0.25g/2.40mL |
| 10-1590 | Pyrene-dU-CE Phosphoramidite | 955.04 | 514.42 | 0.25g/2.62mL |
| 10-1591 | Perylene-dU-CE Phosphoramidite | 1005.1 | 564.48 | 0.25g/2.49mL |
| 10-1598 | 8,5'-Cyclo-dG-CE Phosphoramidite | 619.65 | 327.19 | 0.25g/4.03mL |
| 10-1601 | Pac-dA-CE Phosphoramidite | 887.97 | 313.21 | 0.25g/2.82mL |
| 10-1621 | iPr-Pac-dG-CE Phosphoramidite | 946.05 | 329.21 | 0.25g/2.64mL |
| 10-1700 | dA-Thiophosphoramidite | 955.09 | 345.34 (dithioate) | 0.25g/1.75mL |
| 10-1710 | dC-Thiophosphoramidite | 931.07 | 321.31 (dithioate) | 0.25g/1.79mL |

PHYSICAL DATA

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|---|--------------------|---|-----------------|
| 10-1720 | dG-Thiophosphoramidite | 937.07 | 361.34 (dithioate) | 0.25g/1.78mL |
| 10-1730 | dT-Thiophosphoramidite | 841.97 | 336.32 (dithioate) | 0.25g/1.98mL |
| 10-1891 | Methacrylate C6 Phosphoramidite | 385.48 | 247.23 | 0.25g/6.49mL |
| 10-1900 | Chemical Phosphorylation Reagent | 656.77 | 79.98 | 0.25g/3.81mL |
| 10-1901 | Chemical Phosphorylation Reagent II | 722.82 | 79.98 | 0.25g/3.46mL |
| 10-1902 | Solid Chemical Phosphorylation Reagent II | 692.79 | 79.98 | 0.25g/3.61mL |
| 10-1905 | 5'-Amino-Modifier 5 | 577.71 | 167.1 | 0.25g/4.33mL |
| 10-1906 | 5'-Amino-Modifier C6 | 589.76 | 179.16 | 0.25g/4.24mL |
| 10-1907 | 5'-DMS(O)MT-Amino-Modifier C6 | 681.34 | 179.16 | 0.25g/3.67mL |
| 10-1908 | 5'-Hexynyl Phosphoramidite | 298.36 | 160.11 | 0.25g/8.38mL |
| 10-1909 | Spacer Phosphoramidite 9 | 652.77 | 212.14 | 0.25g/3.83mL |
| 10-1910 | 1-Ethynyl-dSpacer CE Phosphoramidite | 644.74 | 204.12 | 0.25g/3.88mL |
| 10-1911 | Amino-Modifier C6 dR | 831.91 | 295.27 | 0.25g/3.01mL |
| 10-1912 | 5'-Amino-Modifier C12 | 673.92 | 263.32 | 0.25g/3.71mL |
| 10-1913 | Spacer Phosphoramidite C3 | 578.69 | 138.06 | 0.25g/4.32mL |
| 10-1914 | dSpacer CE Phosphoramidite | 620.73 | 180.1 | 0.25g/4.03mL |
| 10-1915 | Pyrrolidine-CE Phosphoramidite | 841.97 | 178.1 | 0.25g/2.97mL |
| 10-1916 | 5'-Amino-Modifier C6-TFA | 413.42 | 179.16 | 0.25g/6.05mL |
| 10-1917 | 5'-Amino-Modifier TEG CE-Phosphoramidite | 489.47 | 255.21 | 0.25g/5.11mL |
| 10-1918 | Spacer Phosphoramidite 18 | 784.93 | 344.3 | 0.25g/3.18mL |
| 10-1919 | 5'-Aminoxy-Modifier-11-CE Phosphoramidite | 711.82 | 271.21 | 0.25g/3.51mL |
| 10-1920 | Symmetric Doubler Phosphoramidite | 1095.32 | 351.31 | 0.25g/2.28mL |
| 10-1922 | Trebler Phosphoramidite | 1417.72 | 370.33 | 0.25g/1.76mL |
| 10-1923 | 5'-Amino-Modifier C3-TFA | 371.34 | 137.08 | 0.25g/6.73mL |
| 10-1925 | Long Trebler Phosphoramidite | 1475.78 | 428.41 | 0.25g/1.69mL |
| 10-1926 | 5'-Thiol-Modifier C6 | 576.78 | 196.2 | 0.25g/4.33mL |
| 10-1927 | Abasic II Phosphoramidite | 750.98 | 196.1 | 0.25g/3.33mL |
| 10-1928 | Spacer C12 CE Phosphoramidite | 704.93 | 264.3 | 0.25g/3.55mL |
| 10-1931 | 5'-I-dT-CE Phosphoramidite | 552.35 | 414.09 | 0.25g/4.53mL |
| 10-1932 | 5'-Amino-dT-CE Phosphoramidite | 713.81 | 303.21 | 0.25g/3.50mL |
| 10-1933 | 5'-Aldehyde-Modifier C2 Phosphoramidite | 480.58 | 228.14 | 0.25g/5.20mL |
| 10-1934 | 5-Formylindole-CE Phosphoramidite | 763.86 | 323.24 | 0.25g/3.27mL |
| 10-1935 | 5'-Carboxy-Modifier C10 | 485.56 | varies, -CO ₂ H = 250.23 | 0.25g/5.15mL |
| 10-1936 | Thiol-Modifier C6 S-S | 769.05 | 328.4 (disulfide) 196.2 (thiol) | 0.25g/3.25mL |
| 10-1938 | 5'-Maleimide-Modifier Phosphoramidite | 437.47 | 299.22 (pre-retro-DA) 203.09 (maleimide) | 0.25g/5.71mL |
| 10-1939 | Spermine Phosphoramidite | 1233.17 | 408.52 | 0.25g/2.03mL |
| 10-1941 | 5'-DBCO-TEG Phosphoramidite | 708.82 | 570.57 | 0.25g/3.53mL |
| 10-1943 | 5'-TCO C6 Phosphoramidite | 469.61 | 331.35 | 0.25g/5.32mL |
| 10-1945 | 5'-Carboxy-Modifier C5 | 595.11 | 180.1 | 0.25g/4.20mL |
| 10-1946 | 5'-Bromohexyl Phosphoramidite | 381.29 | 243.04 (bromide) 205.15 (azide) | 0.25g/6.56mL |
| 10-1947 | 5'-Amino-Modifier C6-PDA | 478.57 | 179.15 | 0.25g/5.22mL |
| 10-1948 | 5'-Amino-Modifier C12-PDA | 562.7 | 263.32 | 0.25g/4.44mL |
| 10-1949 | 5'-Amino-Modifier TEG PDA | 554.62 | 255.21 | 0.25g/4.51mL |
| 10-1952 | DesthiobiotinTEG Phosphoramidite | 980.19 | 539.56 | 0.25g/2.55mL |
| 10-1953 | Biotin Phosphoramidite | 876.1 | 435.48 | 0.25g/2.85mL |
| 10-1954 | 5'-Biotin II Phosphoramidite | 834.03 | 393.39 | 0.25g/3.00mL |
| 10-1955 | BiotinTEG Phosphoramidite | 1010.24 | 569.61 | 0.25g/2.47mL |
| 10-1961 | BHQ-1 Phosphoramidite | 995.13 | 554.49 | 0.25g/2.51mL |
| 10-1962 | BHQ-2 Phosphoramidite | 997.10 | 556.47 | 0.25g/2.51mL |

PHYSICAL DATA

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|--|--------------------|---------|-----------------|
| 10-1963 | Fluorescein Phosphoramidite | 1207.5 | 598.56 | 0.25g/2.07mL |
| 10-1964 | 6-Fluorescein Phosphoramidite | 1176.35 | 566.48 | 0.25g/2.13mL |
| 10-1973 | Acridine Phosphoramidite | 891.53 | 450.86 | 0.25g/2.80mL |
| 10-1974 | 5'-GalNAc C3 Phosphoramidite | 1206.38 | 609.61 | 0.25g/2.07mL |
| 10-1975 | Cholesteryl-TEG Phosphoramidite | 1196.6 | 755.97 | 0.25g/2.09mL |
| 10-1976 | 5'-Cholesteryl-TEG Phosphoramidite | 820.13 | 682.89 | 0.25g/3.05mL |
| 10-1977 | a-Tocopherol-TEG Phosphoramidite | 1139.56 | 698.91 | 0.25g/2.19mL |
| 10-1978 | Palmitate Phosphoramidite | 555.83 | 417.57 | 0.25g/4.50mL |
| 10-1979 | Stearyl Phosphoramidite | 470.71 | 332.46 | 0.25g/5.31mL |
| 10-1981 | Asymmetric Doubler (Lev) Phosphoramidite | 891.04 | 352.32 | 0.25g/2.81mL |
| 10-1982 | Psoralen C2 Phosphoramidite | 502.55 | 364.29 | 0.25g/4.97mL |
| 10-1983 | Psoralen C6 Phosphoramidite | 558.65 | 420.4 | 0.25g/4.48mL |
| 10-1985 | DNP-TEG Phosphoramidite | 950.00 | 509.41 | 0.25g/2.63mL |
| 10-1986 | 5'-Trimethoxystilbene Cap Phosphoramidite | 571.65 | 433.39 | 0.25g/4.37mL |
| 10-1987 | 5'-Pyrene Cap Phosphoramidite | 501.6 | 363.35 | 0.25g/4.98mL |
| 10-1990 | Palmitate Serinol Phosphoramidite | 903.20 | 462.57 | 0.25g/2.77mL |
| 10-1991 | Dithiol Serinol Phosphoramidite | 853.08 | 412.46 | 0.25g/2.93mL |
| 10-1992 | Alkyne-Modifier Serinol Phosphoramidite | 758.88 | 318.26 | 0.25g/3.29mL |
| 10-1993 | Protected Biotin Serinol Phosphoramidite | 1051.28 | 450.45 | 0.25g/2.38mL |
| 10-1994 | 6-Fluorescein Serinol Phosphoramidite | 1191.3 | 582.45 | 0.25g/2.10mL |
| 10-1995 | Protected BiotinLC Serinol Phosphoramidite | 1298.57 | 697.74 | 0.25g/1.93mL |
| 10-1996 | COT Serinol Phosphoramidite | 822.97 | 382.35 | 0.25g/3.04mL |
| 10-1997 | Amino-Modifier Serinol Phosphoramidite | 887.01 | 224.15 | 0.25g/2.82mL |
| 10-1998 | DBCO-Serinol Phosphoramidite | 909.08 | 468.45 | 0.25g/2.75mL |
| 10-2000 | Bz-A-LA-CE Phosphoramidite | 885.96 | 341.22 | 0.25g/2.82mL |
| 10-2011 | 5-Me-Bz-C-LA-CE Phosphoramidite | 875.96 | 331.22 | 0.25g/2.85mL |
| 10-2029 | dmf-G-LA-CE Phosphoramidite | 852.93 | 357.22 | 0.25g/2.93mL |
| 10-2030 | T-LA-CE Phosphoramidite | 772.84 | 332.20 | 0.25g/3.23mL |
| 10-3000 | Pac-A-CE Phosphoramidite | 1018.23 | 329.21 | 0.25g/2.46mL |
| 10-2101 | beta-L-Pac-dA-CE Phosphoramidite | 887.97 | 313.21 | 0.25g/2.82mL |
| 10-2115 | beta-L-Ac-dC-CE Phosphoramidite | 771.85 | 289.18 | 0.25g/3.24mL |
| 10-2121 | beta-L-iPr-dG-CE Phosphoramidite | 946.05 | 329.21 | 0.25g/2.64mL |
| 10-2130 | beta-L-dT-CE Phosphoramidite | 744.83 | 304.20 | 0.25g/3.36mL |
| 10-2190 | A-Serinol-CE Phosphoramidite | 872.96 | 328.22 | 0.25g/2.86mL |
| 10-2191 | C-Serinol-CE Phosphoramidite | 848.94 | 304.20 | 0.25g/2.94mL |
| 10-2192 | G-Serinol-CE Phosphoramidite | 854.95 | 344.22 | 0.25g/2.92mL |
| 10-2193 | T-Serinol-CE Phosphoramidite | 759.84 | 319.21 | 0.25g/3.29mL |
| 10-2211 | 5-Me-C-scpBNA™-CE Phosphoramidite | 902.00 | 357.26 | 0.25g/2.77mL |
| 10-2230 | T-scpBNA™-CE Phosphoramidite | 798.87 | 358.24 | 0.25g/3.13mL |
| 10-2390 | A-Serinol-CE Phosphoramidite | 872.96 | 328.22 | 0.25g/2.86mL |
| 10-2391 | C-Serinol-CE Phosphoramidite | 848.94 | 304.2 | 0.25g/2.94mL |
| 10-2392 | G-Serinol-CE Phosphoramidite | 854.95 | 344.22 | 0.25g/2.92mL |
| 10-2393 | T-Serinol-CE Phosphoramidite | 759.84 | 319.21 | 0.25g/3.29mL |
| 10-3003 | Bz-A-CE Phosphoramidite | 988.21 | 329.21 | 0.25g/2.53mL |
| 10-3004 | A-TOM-CE Phosphoramidite | 998.24 | 329.21 | 0.25g/2.50mL |
| 10-3005 | N6-Methyl-A-CE Phosphoramidite | 1032.25 | 343.23 | 0.25g/2.42mL |
| 10-3011 | Zebularine-CE Phosphoramidite | 845.05 | 290.17 | 0.25g/2.96mL |
| 10-3012 | Pyridin-2-one-CE Phosphoramidite | 844.06 | 289.18 | 0.25g/2.96mL |
| 10-3013 | N3-Methyl-C-CE Phosphoramidite | 916.14 | 319.21 | 0.25g/2.73mL |
| 10-3014 | C-TOM-CE Phosphoramidite | 974.22 | 305.18 | 0.25g/2.57mL |
| 10-3015 | Ac-C-CE Phosphoramidite | 902.11 | 305.18 | 0.25g/2.77mL |

PHYSICAL DATA

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|---|--------------------|---------|-----------------|
| 10-3017 | Pyrrolo-C-TOM-CE Phosphoramidite | 970.23 | 343.27 | 0.25g/2.58mL |
| 10-3021 | iPr-Pac-G-CE Phosphoramidite | 1076.31 | 345.21 | 0.25g/2.32mL |
| 10-3024 | G-TOM-CE Phosphoramidite | 1014.24 | 345.21 | 0.25g/2.46mL |
| 10-3025 | Ac-G-CE Phosphoramidite | 941.43 | 345.21 | 0.25g/2.66mL |
| 10-3030 | U-CE Phosphoramidite | 861.06 | 306.17 | 0.25g/2.90mL |
| 10-3034 | U-TOM-CE Phosphoramidite | 933.17 | 306.17 | 0.25g/2.68mL |
| 10-3039 | Amino-Modifier C6-U Phosphoramidite | 1197.41 | 474.4 | 0.25g/2.09mL |
| 10-3040 | I-CE Phosphoramidite | 885.08 | 330.19 | 0.25g/2.82mL |
| 10-3050 | 5-Me-U-CE Phosphoramidite | 875.08 | 320.19 | 0.25g/2.86mL |
| 10-3052 | 4-Thio-U-TOM-CE Phosphoramidite | 1002.29 | 322.22 | 0.25g/2.49mL |
| 10-3055 | PseudoUridine-CE Phosphoramidite | 861.05 | 306.17 | 0.25g/2.90mL |
| 10-3056 | 1-Methyl-PseudoUridine Phosphoramidite | 875.07 | 320.19 | 0.25g/2.86mL |
| 10-3064 | 5-Me-C-TOM-CE Phosphoramidite | 988.25 | 319.21 | 0.25g/2.53mL |
| 10-3070 | 2-Aminopurine-TBDMS-CE Phosphoramidite | 954.19 | 329.21 | 0.25g/2.62mL |
| 10-3072 | 6-Thio-G-CE Phosphoramidite | 1039.31 | 361.26 | 0.25g/2.41mL |
| 10-3083 | 8-Aza-7-deaza-A-CE Phosphoramidite | 939.16 | 329.21 | 0.25g/2.66mL |
| 10-3085 | 2,6-Diaminopurine-TOM-CE Phosphoramidite | 1113.36 | 344.22 | 0.25g/2.25mL |
| 10-3090 | Br-U-CE Phosphoramidite | 939.96 | 385.06 | 0.25g/2.66mL |
| 10-3091 | 5-I-U-CE Phosphoramidite | 986.96 | 432.07 | 0.25g/2.53mL |
| 10-3100 | 2'-OMe-A-CE Phosphoramidite | 887.97 | 343.24 | 0.25g/2.82mL |
| 10-3105 | 2'-OMe-N6-Me-A-CE Phosphoramidite | 932.03 | 357.28 | 0.25g/2.68mL |
| 10-3110 | 2'-OMe-C-CE Phosphoramidite | 863.95 | 319.21 | 0.25g/2.89mL |
| 10-3111 | 2'-OMe-TMP-5-F-U-CE Phosphoramidite | 897.08 | 337.2 | 0.25g/2.79mL |
| 10-3115 | 2'-OMe-Ac-C-CE Phosphoramidite | 801.88 | 319.21 | 0.25g/3.12mL |
| 10-3116 | 2'-OMe-3-deaza-5-aza-C-CE Phosphoramidite | 816.91 | 319.21 | 0.25g/3.06mL |
| 10-3120 | 2'-OMe-ibu-G-CE Phosphoramidite | 869.97 | 359.24 | 0.25g/2.87mL |
| 10-3121 | 2'-OMe-G-CE Phosphoramidite | 854.93 | 359.24 | 0.25g/2.92mL |
| 10-3123 | 2'-OMe-2-Aminopurine-CE Phosphoramidite | 839.04 | 343.24 | 0.25g/2.98mL |
| 10-3124 | 2'-OMe-2,6-Diaminopurine-CE Phosphoramidite | 924.05 | 358.25 | 0.25g/2.71mL |
| 10-3130 | 2'-OMe-U-CE Phosphoramidite | 760.82 | 320.2 | 0.25g/3.29mL |
| 10-3131 | 2'-OMe-5-Me-U-CE Phosphoramidite | 774.84 | 334.22 | 0.25g/3.23mL |
| 10-3132 | 2'-OMe-5-F-U-CE Phosphoramidite | 778.78 | 338.19 | 0.25g/3.21mL |
| 10-3140 | 2'-OMe-I-CE Phosphoramidite | 784.85 | 344.22 | 0.25g/3.19mL |
| 10-3150 | 2'-OMe-A-PACE Phosphoramidite | 958.07 | 385.27 | 0.25g/2.61mL |
| 10-3151 | 2'-OMe-Ac-C-PACE Phosphoramidite | 871.97 | 361.25 | 0.25g/2.87mL |
| 10-3152 | 2'-OMe-G-PACE Phosphoramidite | 940.05 | 401.27 | 0.25g/2.66mL |
| 10-3153 | 2'-OMe-U-PACE Phosphoramidite | 830.92 | 362.23 | 0.25g/3.01mL |
| 10-3160 | 2'-OMe-5-Me-C-CE Phosphoramidite | 815.9 | 333.24 | 0.25g/3.06mL |
| 10-3170 | 2'-OMe-A-Thiophosphoramidite | 985.12 | 375.36 | 0.25g/1.69mL |
| 10-3171 | 2'-OMe-C-Thiophosphoramidite | 899.02 | 351.34 | 0.25g/1.85mL |
| 10-3172 | 2'-OMe-G-Thiophosphoramidite | 967.1 | 391.36 | 0.25g/1.72mL |
| 10-3173 | 2'-OMe-U-Thiophosphoramidite | 857.97 | 352.32 | 0.25g/1.94mL |
| 10-3190 | 2'-OMe-5-Br-U-CE Phosphoramidite | 839.72 | 399.09 | 0.25g/2.98mL |
| 10-3200 | A-2'-MOE-Phosphoramidite | 932.03 | 387.29 | 0.25g/2.68mL |
| 10-3211 | 5-Me-C-2'-MOE-Phosphoramidite | 922.03 | 377.29 | 0.25g/2.71mL |
| 10-3220 | G-2'-MOE-Phosphoramidite | 914.01 | 403.29 | 0.25g/2.74mL |
| 10-3231 | 5-Me-U-2'-MOE-Phosphoramidite | 818.90 | 378.27 | 0.25g/3.05mL |
| 10-3400 | 2'-F-A-CE Phosphoramidite | 875.93 | 331.2 | 0.25g/2.85mL |
| 10-3415 | 2'-F-Ac-C-CE Phosphoramidite | 789.84 | 307.18 | 0.25g/3.17mL |
| 10-3420 | 2'-F-G-CE Phosphoramidite | 857.91 | 347.19 | 0.25g/2.91mL |
| 10-3430 | 2'-F-U-CE Phosphoramidite | 748.79 | 308.16 | 0.25g/3.34mL |

PHYSICAL DATA

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|---|--------------------|---------|-----------------|
| 10-3440 | 2'-F-I-CE Phosphoramidite | 772.82 | 332.18 | 0.25g/3.23mL |
| 10-3501 | 1-Me-A-CE Phosphoramidite | 944.57 | 344.24 | 0.25g/2.65mL |
| 10-3517 | Ribo-tC° Phosphoramidite | 950.16 | 395.26 | 0.25g/2.63mL |
| 10-3601 | 2'-OMe-Pac-A-CE Phosphoramidite | 917.99 | 343.24 | 0.25g/2.72mL |
| 10-3621 | 2'-OMe-iPr-Pac-G-CE Phosphoramidite | 976.07 | 359.24 | 0.25g/2.56mL |
| 10-3800 | 2'-FANA-A-CE Phosphoramidite | 875.93 | 331.2 | 0.25g/2.85mL |
| 10-3815 | 2'-FANA-Ac-C-CE Phosphoramidite | 789.83 | 307.17 | 0.25g/3.16mL |
| 10-3820 | 2'-FANA-G-CE Phosphoramidite | 857.91 | 347.19 | 0.25g/2.91mL |
| 10-3830 | 2'-FANA-U-CE Phosphoramidite | 748.79 | 308.16 | 0.25g/3.34mL |
| 10-3850 | 2'-F-5-Me-U-ANA-CE Phosphoramidite | 762.80 | 322.18 | 0.25g/3.28mL |
| 10-3914 | rSpacer CE Phosphoramidite | 823.09 | 196.09 | 0.25g/3.04mL |
| 10-3915 | rSpacer TBDMS CE Phosphoramidite | 750.99 | 196.09 | 0.25g/3.33mL |
| 10-4191 | dSpacer-5'-CE Phosphoramidite | 620.73 | 180.10 | 0.25g/4.03mL |
| 10-4410 | UniCap Phosphoramidite | 334.39 | | 0.25g/7.48mL |
| 10-4906 | PC Amino-Modifier Phosphoramidite | 605.59 | 371.32 | 0.25g/4.13mL |
| 10-4913 | PC Spacer Phosphoramidite | 784.88 | 344.26 | 0.25g/3.19mL |
| 10-4920 | PC Linker Phosphoramidite | 699.78 | 259.15 | 0.25g/3.57mL |
| 10-4950 | PC Biotin Phosphoramidite | 1038.25 | 597.62 | 0.25g/2.41mL |
| 10-4960 | 3-Cyanovinylcarbazole Phosphoramidite (CNVK) | 836.95 | 396.33 | 0.25g/2.99mL |
| 10-5000 | Universal-CE Phosphoramidite | 801.87 | | 0.25g/3.12mL |
| 10-5101 | Ac-dC-5'-CE Phosphoramidite | 771.85 | 289.18 | 0.25g/3.24mL |
| 10-5800 | Azobenzene Phosphoramidite | 815.94 | 375.32 | 0.25g/3.06mL |
| 10-5901 | 5'-Fluorescein Phosphoramidite | 843.95 | 537.46 | 0.25g/2.96mL |
| 10-5902 | 5'-Hexachloro-Fluorescein Phosphoramidite | 1050.62 | 744.13 | 0.25g/2.38mL |
| 10-5903 | 5'-Tetrachloro-Fluorescein Phosphoramidite | 981.73 | 675.24 | 0.25g/2.55mL |
| 10-5905 | SIMA (HEX) Phosphoramidite | 1065.02 | 759.54 | 0.25g/2.35mL |
| 10-5906 | 5'-Dichloro-dimethoxy-Fluorescein Phosphoramidite II | 972.88 | 666.4 | 0.25g/2.57mL |
| 10-5912 | 5'-DabcyI Phosphoramidite | 568.69 | 430.18 | 0.25g/4.40mL |
| 10-5913 | Cyanine 3 Phosphoramidite | 953.64 | 507.59 | 0.25g/2.62mL |
| 10-5936 | JOE-dT Phosphoramidite | 1552.5 | 944.2 | 0.25g/1.61mL |
| 10-5953 | Quasar® 570-dT Phosphoramidite | 1497.65 | 911.05 | 0.25g/1.67mL |
| 10-5955 | Quasar® 670-dT Phosphoramidite | 1523.69 | 937.09 | 0.25g/1.64mL |
| 10-5914 | Cyanine 3.5 Phosphoramidite | 1053.76 | 607.7 | 0.25g/2.37mL |
| 10-5915 | Cyanine 5 Phosphoramidite | 979.68 | 533.63 | 0.25g/2.55mL |
| 10-5916 | Cyanine 5.5 Phosphoramidite | 1171.25 | 633.74 | 0.25g/2.13mL |
| 10-5920 | Redmond Red® Phosphoramidite | 971.09 | 445.34 | 0.25g/2.57mL |
| 10-5921 | Yakima Yellow® Phosphoramidite | 1023.81 | 718.33 | 0.25g/2.44mL |
| 10-5923 | 5'-AquaPhluor® 593 CE Phosphoramidite | 1239.17 | 787.82 | 0.25g/2.02mL |
| 10-5924 | 5'-CDPI3 MGB™ Phosphoramidite | 1323.42 | 872.96 | 0.25g/1.89mL |
| 10-5925 | Eclipse® Quencher Phosphoramidite | 978.5 | 537.89 | 0.25g/2.55mL |
| 10-5931 | 5'-BHQ-1 Phosphoramidite | 676.75 | 538.49 | 0.25g/3.69mL |
| 10-5932 | 5'-BHQ-2 Phosphoramidite | 678.72 | 540.47 | 0.25g/3.68mL |
| 10-5934 | 5'-BBQ-650®-CE Phosphoramidite | 802.9 | 665.65 | 0.25g/3.11mL |
| 10-5941 | BHQ-1-dT | 1401.56 | 960.93 | 0.25g/1.78mL |
| 10-5942 | BHQ-2-dT | 1403.53 | 962.91 | 0.25g/1.78mL |
| 10-5944 | BBQ-650®-dT-CE Phosphoramidite | 1441.57 | 1000.95 | 0.25g/1.73mL |
| 10-5945 | SIMA (HEX)-dT Phosphoramidite | 1646.64 | 1037.79 | 0.25g/1.52mL |
| 10-5950 | 5'-Biotin Phosphoramidite | 846.08 | 405.45 | 0.25g/2.95mL |
| 10-5961 | Methylene Blue II Phosphoramidite | 967.67 | 489.57 | 0.25g/2.58mL |

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| 10-7001 | 2,3'-ddA-CE Phosphoramidite | 574.7 | 297.21 | 0.25g/4.35mL |
|----------|---------------------------------------|--------------------|---------|-----------------|
| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
| 10-7101 | 2,3'-ddC-CE Phosphoramidite | 550.68 | 273.18 | 0.25g/4.54mL |
| 10-7201 | 2,3'-ddG-CE Phosphoramidite | 506.54 | 313.2 | 0.25g/4.94mL |
| 10-7301 | 2,3'-ddT-CE Phosphoramidite | 426.45 | 288.19 | 0.25g/5.86mL |
| 10-9201 | dmf-dG-5'-CE Phosphoramidite | 824.92 | 329.21 | 0.25g/3.03mL |
| 11-1330 | Cis-syn Thymine Dimer Phosphoramidite | 1024.01 | 608.39 | 0.25g/2.44mL |
| 13-1000 | AAA Trimer Phosphoramidite | 1911.5 | | 0.25g/1.31mL |
| 13-1001 | AAC Trimer Phosphoramidite | 1887.5 | | 0.25g/1.32mL |
| 13-1011 | ACC Trimer Phosphoramidite | 1863.5 | | 0.25g/1.34mL |
| 13-1013 | ACT Trimer Phosphoramidite | 1774.5 | | 0.25g/1.41mL |
| 13-1020 | AGA Trimer Phosphoramidite | 1893.5 | | 0.25g/1.32mL |
| 13-1031 | ATC Trimer Phosphoramidite | 1774.5 | | 0.25g/1.41mL |
| 13-1032 | ATG Trimer Phosphoramidite | 1780.5 | | 0.25g/1.40mL |
| 13-1102 | CAG Trimer Phosphoramidite | 1869.5 | | 0.25g/1.34mL |
| 13-1103 | CAT Trimer Phosphoramidite | 1774.5 | | 0.25g/1.41mL |
| 13-1110 | CCA Trimer Phosphoramidite | 1863.5 | | 0.25g/1.34mL |
| 13-1112 | CCG Trimer Phosphoramidite | 1845.5 | | 0.25g/1.35mL |
| 13-1122 | CGG Trimer Phosphoramidite | 1851.5 | | 0.25g/1.35mL |
| 13-1123 | CGT Trimer Phosphoramidite | 1756.5 | | 0.25g/1.42mL |
| 13-1132 | CTG Trimer Phosphoramidite | 1756.5 | | 0.25g/1.42mL |
| 13-1200 | GAA Trimer Phosphoramidite | 1893.5 | | 0.25g/1.32mL |
| 13-1201 | GAC Trimer Phosphoramidite | 1869.5 | | 0.25g/1.34mL |
| 13-1203 | GAT Trimer Phosphoramidite | 1780.5 | | 0.25g/1.40mL |
| 13-1210 | GCA Trimer Phosphoramidite | 1869.5 | | 0.25g/1.34mL |
| 13-1212 | GCG Trimer Phosphoramidite | 1851.5 | | 0.25g/1.35mL |
| 13-1213 | GCT Trimer Phosphoramidite | 1756.5 | | 0.25g/1.42mL |
| 13-1223 | GGT Trimer Phosphoramidite | 1762.5 | | 0.25g/1.42mL |
| 13-1230 | GTA Trimer Phosphoramidite | 1780.5 | | 0.25g/1.40mL |
| 13-1233 | GTT Trimer Phosphoramidite | 1667.5 | | 0.25g/1.50mL |
| 13-1301 | TAC Trimer Phosphoramidite | 1774.5 | | 0.25g/1.41mL |
| 13-1313 | TCT Trimer Phosphoramidite | 1661.4 | | 0.25g/1.50mL |
| 13-1321 | TGC Trimer Phosphoramidite | 1756.5 | | 0.25g/1.42mL |
| 13-1322 | TGG Trimer Phosphoramidite | 1762.5 | | 0.25g/1.42mL |
| 13-1331 | TTC Trimer Phosphoramidite | 1661.4 | | 0.25g/1.50mL |
| 13-1333 | TTT Trimer Phosphoramidite | 1572.4 | | 0.25g/1.59mL |
| 20-0002 | dA-5'-CPG | | 313.21 | |
| 20-0102 | dC-5'-CPG | | 289.18 | |
| 20-0202 | dG-5'-CPG | | 329.21 | |
| 20-0302 | dT-5'-CPG | | 304.2 | |
| 20-2000 | dA-CPG 500 | | 313.21 | |
| 20-2001 | dA-CPG 1000 | | 313.21 | |
| 20-2002 | dA-CPG 2000 | | 313.21 | |
| 20-2004 | 3'-dA-CPG | | 313.21 | |
| 20-2010 | dC-CPG 500 | | 289.18 | |
| 20-2011 | dC-CPG 1000 | | 289.18 | |
| 20-2012 | dC-CPG 2000 | | 289.18 | |
| 20-2013 | Ac-dC-CPG 500 | | 289.18 | |
| 20-2015 | Ac-dC-CPG 1000 | | 289.18 | |
| 20-2017 | 2,3'-ddC-CPG | | 273.19 | |
| 20-2019 | 3'-Amino-Modifier C6 dC CPG | | 457.42 | |

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| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|------------|-------------------------------|------------------------------------|---------|-----------------|
| 20-2020 | dG-CPG 500 | | 329.21 | |
| 20-2021 | dG-CPG 1000 | | 329.21 | |
| 20-2022 | dG-CPG 2000 | | 329.21 | |
| 20-2029 | dmf-dG-CPG | | 329.21 | |
| 20-2030 | dT-CPG 500 | | 304.2 | |
| 20-2031 | dT-CPG 1000 | | 304.2 | |
| 20-2032 | dT-CPG 2000 | | 304.2 | |
| 20-2040 | dI-CPG 500 | | 314.19 | |
| 20-2041 | dI-CPG 1000 | | 314.19 | |
| 20-2050 | dU-CPG 500 | | 290.17 | |
| 20-2051 | dU-CPG 1000 | | 290.17 | |
| 20-2056 | 3'-Fluorescein-dT CPG | | 815.71 | |
| 20-2064 | 3'-dC-CPG | | 289.18 | |
| 20-2074 | 3'-dG-CPG | | 329.21 | |
| 20-2084 | 3'-dT-CPG | | 304.2 | |
| 20-2090 | 5-Br-dU-CPG | | 369.07 | |
| 20-2101-61 | dA-CPG 1000 | | 313.21 | |
| 20-2101-62 | dA-CPG 1000 | | 313.21 | |
| 20-2101-65 | dA-CPG 1000 | | 313.21 | |
| 20-2115-61 | Ac-dC-CPG 1000 | | 289.18 | |
| 20-2115-62 | Ac-dC-CPG 1000 | | 289.18 | |
| 20-2115-65 | Ac-dC-CPG 1000 | | 289.18 | |
| 20-2129-61 | dmf-dG-CPG | | 329.21 | |
| 20-2129-62 | dmf-dG-CPG | | 329.21 | |
| 20-2129-65 | dmf-dG-CPG | | 329.21 | |
| 20-2131-61 | dT-CPG 1000 | | 304.2 | |
| 20-2131-62 | dT-CPG 1000 | | 304.2 | |
| 20-2131-65 | dT-CPG 1000 | | 304.2 | |
| 20-2501 | Bz-A-LA-CPG | | 341.22 | |
| 20-2511 | Bz-5-Me-C-LA-CPG | | 331.22 | |
| 20-2529 | dmf-G-LA-CPG | | 357.22 | |
| 20-2530 | T-LA-CPG | | 332.2 | |
| 20-2601 | Pac-dA-CPG | | 313.21 | |
| 20-2621 | iPr-Pac-dG-CPG | | 329.21 | |
| 20-2900 | 3'-Phosphate CPG | | 79.98 | |
| 20-2902 | 3'-Glyceryl CPG | | 154.06 | |
| 20-2903 | 3'-CPR II CPG | | 79.98 | |
| 20-2913 | 3'-Spacer C3 CPG | | 138.06 | |
| 20-2933 | 3'-Thiol-Modifier C3 S-S CPG | 154.12 (thiol), 244.27 (disulfide) | | |
| 20-2938 | 3'-Thiol-Modifier 6 S-S CPG | 198.18 (thiol), 332.37 (disulfide) | | |
| 20-2952 | DesthiobiotinTEG-CPG | | 539.56 | |
| 20-2954 | 3'-PT-Amino-Modifier C3 CPG | | 137.07 | |
| 20-2955 | 3'-BiotinTEG CPG | | 569.61 | |
| 20-2956 | 3'-PT-Amino-Modifier C6 CPG | | 179.15 | |
| 20-2958 | 3'-Amino-Modifier C7 CPG 1000 | | 209.18 | |
| 20-2961 | 3'-(6-FAM) CPG | | 569.46 | |
| 20-2963 | 3'-Fluorescein CPG | | 598.56 | |
| 20-2964 | 3'-(6-Fluorescein) CPG | | 566.48 | |
| 20-2973 | 3'-Acridine CPG | | 450.86 | |
| 20-2974 | GalNAc C3 CPG | | 609.61 | |

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| Cat. No. | Item | MW | Unit FW | Dilution (0.1M) |
|----------|-----------------------------------|----|---------|-----------------|
| 20-2975 | 3'-Cholesteryl-TEG CPG | | 755.97 | |
| 20-2980 | 3'-Uaq Cap CPG | | 539.39 | |
| 20-2981 | 3'-Amino-dT CPG | | 303.21 | |
| 20-2982 | 3'-Propargyl-5-Me-dC CPG | | 341.26 | |
| 20-2991 | 3'-Dithiol Serinol CPG | | 412.46 | |
| 20-2992 | 3'-Alkyne-Modifier Serinol CPG | | 334.26 | |
| 20-2993 | 3'-Protected Biotin Serinol CPG | | 450.45 | |
| 20-2994 | 3'-6-Fluorescein Serinol CPG | | 584.47 | |
| 20-2995 | 3'-Protected BiotinLC Serinol CPG | | 697.74 | |
| 20-2997 | 3'-Amino-Modifier Serinol CPG | | 224.15 | |
| 20-2998 | 3'-DBCO-Serinol CPG | | 468.45 | |
| 20-2999 | 3'-Azido-Modifier Serinol CPG | | 335.26 | |
| 20-3300 | Pac-A-RNA-CPG | | 329.21 | |
| 20-3303 | Bz-A-RNA-CPG | | 329.21 | |
| 20-3304 | Ac-A-RNA-CPG | | 329.21 | |
| 20-3315 | Ac-C-RNA-CPG | | 305.18 | |
| 20-3321 | iPr-Pac-G-RNA-CPG | | 345.21 | |
| 20-3324 | Ac-G-RNA-CPG | | 345.21 | |
| 20-3330 | U-RNA-CPG | | 306.17 | |
| 20-3600 | 2'-OMe-A-RNA-CPG | | 343.24 | |
| 20-3610 | 2'-OMe-C-RNA-CPG | | 319.21 | |
| 20-3615 | 2'-OMe-Ac-C-RNA-CPG | | 319.21 | |
| 20-3621 | 2'-OMe-G-RNA-CPG | | 359.24 | |
| 20-3630 | 2'-OMe-U-RNA-CPG | | 320.2 | |
| 20-4040 | Puromycin-CPG | | 533.48 | |
| 20-5910 | 3'-TAMRA CPG | | 623.6 | |
| 20-5911 | 3'-Dabsyl CPG | | 498.49 | |
| 20-5912 | 3'-Dabcyl CPG | | 462.44 | |
| 20-5913 | Cyanine 3 CPG | | 507.59 | |
| 20-5915 | Cyanine 5 CPG | | 533.63 | |
| 20-5920 | Redmond Red® CPG | | 445.34 | |
| 20-5921 | Yakima Yellow® CPG | | 718.33 | |
| 20-5923 | AquaPhluor® 593 CPG | | 900.93 | |
| 20-5924 | CDPI3 MGB™ CPG | | 831.87 | |
| 20-5925 | Eclipse® Quencher CPG | | 537.89 | |
| 20-5927 | MGB Eclipse® CPG | | 1120.56 | |
| 20-5931 | 3'-BHQ-1 CPG | | 554.49 | |
| 20-5932 | 3'-BHQ-2 CPG | | 556.47 | |
| 20-5933 | 3'-BHQ-3 CPG | | 597.63 | |
| 20-5934 | BBQ-650® CPG | | 667.63 | |
| 20-9202 | dmf-dG-5'-CPG | | 329.21 | |
| 21-2000 | dA-Q-CPG 500 | | 313.21 | |
| 21-2010 | dC-Q-CPG 500 | | 289.18 | |
| 21-2013 | Ac-dC-Q-CPG 500 | | 305.18 | |
| 21-2029 | dmf-dG-Q-CPG 500 | | 329.21 | |
| 21-2030 | dT-Q-CPG 500 | | 304.2 | |
| 25-2000 | dA-High Load-CPG | | 313.21 | |
| 25-2010 | dC-High Load-CPG | | 289.18 | |
| 25-2020 | dG-High Load CPG | | 329.21 | |
| 25-2030 | dT-High Load-CPG | | 304.2 | |

PHYSICAL DATA

| Cat. No. | Item | Phosphoramidite MW | Unit FW | Dilution (0.1M) |
|----------|------------------------------|--------------------|---------|-----------------|
| 25-2900 | 3'-Phosphate CPG (High Load) | | 79.98 | |
| 26-2600 | dA PS | | 313.21 | |
| 26-2610 | dC PS | | 289.18 | |
| 26-2629 | dmf-dG PS | | 329.21 | |
| 26-2630 | dT-PS | | 304.2 | |
| 26-2900 | 3'-Phosphate PS | | 79.98 | |
| 26-2955 | 3'-BiotinTEG PS | | 569.61 | |
| 26-2956 | 3'-PT-Amino-Modifier C6 PS | | 179.15 | |
| 26-2961 | 3'-(6-FAM) PS | | 569.46 | |
| 26-5910 | 3'-TAMRA PS | | 623.6 | |
| 26-5912 | 3'-Dabcyl PS | | 462.44 | |
| 50-1904 | Azidobutyrate NHS Ester | 226.19 | 113.12 | |
| 50-1905 | Alkyne-NHS Ester | 225.2 | 110.11 | |
| 50-1938 | Maleimide NHS Ester (SMCC) | 334.32 | 219.23 | |
| 50-1941 | DBCO-sulfo-NHS Ester | 532.5 | 316.37 | |
| 50-1960 | Methylene Blue NHS Ester | 538.96 | 425.89 | |
| 50-1970 | Thiazole Orange NHS Ester | 538.06 | 386.51 | |
| 50-2000 | BiotinTEG Azide | 444.55 | | |
| 50-2001 | DesthiobiotinTEG Azide | 414.5 | | |
| 50-2002 | Dipivaloyl 6-FAM-TEG Azide | 744.79 | | |
| 50-2003 | 6-FAM-TEG Azide | 576.55 | | |
| 50-2004 | Coumarin Azide | 203.15 | | |
| 50-2005 | 6-HEX Azide | 665.09 | | |
| 50-2006 | 6-TET Azide | 596.2 | | |
| 50-2007 | TEMPO Azide | 197.26 | | |
| 50-2008 | TEMPO-TEG Azide | 373.47 | | |
| 50-2009 | Psoralen Azide | 283.28 | | |
| 50-2010 | Disulfo-Cyanine 7 Azide | 829.08 | | |
| 50-5901 | Fluorescein NHS ester | 473.39 | 358.31 | |
| 50-5910 | TAMRA NHS Ester | 527.53 | 413.45 | |
| 50-5911 | ROX NHS Ester | 631.69 | 516.60 | |
| 50-5913 | sulfoCyanine 3 NHS Ester | 751.91 | 598.73 | |
| 50-4950 | PC Biotin NHS Ester | 840.90 | 725.81 | |

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