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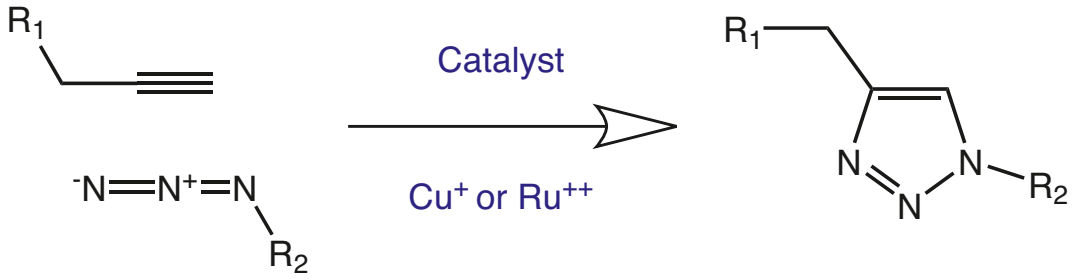
1. The Click Reaction



Azido and alkyne functions can cyclise by an intramolecular CuI or Cu0 catalyzed azide-alkyne 1,3-dipolar cycloaddition (CuAAC). This so-called Click Reaction, developed by K. Barry Sharpless and Morton Meldal, has meanwhile grown to a widely used type of reaction orthogonal to many other types of reactions in different kinds of applications. Both residues R1 and R2 can be used either as conjugation partners or as substrates. Due to its high thermodynamic driving force, usually greater than 20 kcal/mol, the click reaction normally proceeds rapidly to completion and also tends to be highly selective for a single product.

A variety of azido and alkyne building blocks is available, where some can be incorporated into biomolecules by recombinant syntheses, in particular by non natural protein translation using the amber-suppression-based orthogonal system or by chemical reactions, for example by solid phase synthesis. Then the conjugation with a second molecule carrying the appropriate other function can be done.

Tris(benzyltriazolylmethyl)amine (TBTA; RL-2010; see p. 72) is stabilizing copper(I) towards oxidation in solution by forming a complex and catalyzes effectively quantitative, regioselective Huisgen 1,3-dipolar cycloadditions between alkynes and azides (the so called ‚click' cycloaddition reaction), in a variety of aqueous and organic solvents. In the literature, it has been gaining widespread use as a biochemical tool for the tagging of proteins and enzymes.

References:

- A stepwise Huisegen cycloaddition process: copper (I)-catalyzed regioselective ligation of azides and terminal alkynes; Vsevolod V. Rostovtsev, Luke G. Green and K. Barry Sharpless; *Angew. Chem. Int. Ed.* 2002; **41:** 2596-2599.
- Peptidotriazoles on solid phase: [1,2,3]-triazoles by regiospecific copper(I)-catalyzed 1,3-dipolar cycloaddition of terminal alkynes to azides; Christian W. Tornøe, Caspar Christensen; Morten Meldal; *J.Org.Chem.* 2002; **67:** 3057-3064.
- Click Chemistry: Diverse Chemical Function from a Few Good Reactions; Hartmuth C. Kolb, M. G. Finn, and K. Barry Sharpless, *Angew. Chem., Int. Eng. Ed.* 2001; **40:** 2004-2021.
- The growing impact of click chemistry on drug discovery; Hartmuth C. Kolb and K. Barry Sharpless; *Drug Discovery Today* 2003; **8(24):** 1128-1131.
- Cu-I-Catalyzed Alkyne-Azide „Click" Cycloadditions from a Mechanistic and Synthetic Perspective; Victoria C. Bock, Henk Hiemstra and Jan H. van Maarseveen; *Eur. J. Org. Chem.* 2006; **1:** 51-68.
- A3-Type Star Polymer via Click Chemistry; O. Altintas, B. Yankul, G. Hizal and U. Tunca; *J. Poly. Sci.: Part A, Polymer Chem.* 2006; **44:** 6458-6465.
- Preparation of alumina supported copper nanoparticles and their application in the synthesis of 1,2,3- triazoles; M. Lakshmi Kantam *et al.*; *J. Mol. Catal. A: Chem.* 2006; **256:** 273-277.
- A Rapid and Versatile Method to Label Receptor Ligand Using „Click" Chemistry: Validation with the Muscarinic M1 Antagonist Pirenzepine; Dominique Bonnet *et al.; Bioconjugate Chemistry* 2006; **17:** 1618-1623.
- Alkyne-azide click reaction catalyzed by metallic copper under ultrasound; Pedro Cintas *et al.; Nature Protocols* 2010; **5(3):** 607-616.
- Synthesis of a DOTA-Biotin Conjugate for Radionuclide Chelation via Cu-Free Click Chemistry; Michael K. Schultz, Sharavathi G. Parameswarappa, and F. Christopher Pigge; *Org. Lett.* 2010; **12(10):** 2398-2401.
- Polytriazoles as Copper(I)-Stabilizing Ligands in Catalysis; Timothy R. Chan, Robert Hilgraf, K. Barry Sharpless, and Valery V. Fokin; *Org. Lett.* 2004; **6(17):** 2853-2855. doi:10.1021/ol0493094.
- "Click" Cycloaddition Catalysts: Copper(I) and Copper(II) Tris(triazolylmethyl)amine Complexes; Paul S. Donnely *et al.; Chem. Commun.* 2008; **(21):** 2459-2461. doi:10.1039/b719724a

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a) Catalyst-free Click Reaction

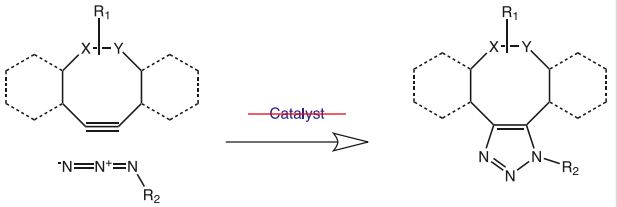
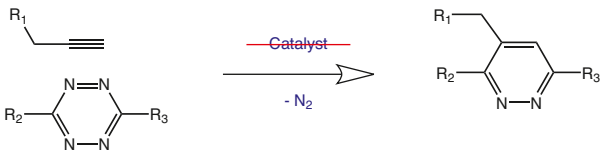
Cycloaddition reactions such as the [3+2] azide-alkyne and the [4+2] Diels-Alder reaction, are becoming common conjugation techniques. Applications range from imaging, drug design and development of sensors, thereby spanning the fields of chemical biology, material science, surface and polymer chemistry as well as many other fields.

Introduced in 2002, the copper-catalyzed variant of the azide-alkyne cycloaddition (CuAAC) reaction has found broad applicability in the aforementioned field and as such is currently the most widely used conjugation technique. The presence of copper, however, limits the in vivo application of this reaction for several reasons:

- High cell toxicity
- Undesired oxidation of proteins and
- Inhibition of luminescence properties of nanocrystals

To allow fast and efficient in vivo conjugation, new methodologies have emerged that do not require the use of a metal catalysts, while still making use of the bioorthogonal functional groups, i.e. azides and alkynes. The most commonly used approaches can be classified into two categories:

- Strained cyclooctyne systems that react rapidly with azides.
- Substituted 1,2,4,5-tetrazines for fast reactions with (un)strained alkenes/alkynes.

Strained Cyclooctynes	Substituted 1,2,4,5-tetrazines
	

Review articles on copper-free cycloaddition reactions:

- Bioorthogonal labelling of biomolecules: new functional handles and ligation methods; Marjoke F. Debets, Jan C. M. van Hest and Floris P. J. T. Rutjes; *Org. Biomol. Chem.* 2013; **11:** 6439-6455; DOI: 10.1039/c3ob41329b.
- Bioconjugation with Strained Alkenes and Alkynes; Marjoke F. Debets, Sander S. van Berkel, Jan Dommerholt, A. (Ton) J. Dirks, Floris P. J. T. Rutjes, and Floris L. van Delft; *Accounts of Chemical Research* 2011; **44(9):** 805-815. DOI: 10.1021/ar200059z.
- Azide: A Unique Dipole for Metal-Free Bioorthogonal Ligations; Marjoke F. Debets, Christianus W. J. van der Doelen, Floris P. J. T. Rutjes, and Floris L. van Delft; *ChemBioChem* 2010; **11:** 1168 - 1184. DOI: 10.1002/cbic.201000064.
- Bioorthogonal Chemistry: Fishing for Selectivity in a Sea of Functionality; Ellen M. Sletten, Carolyn R. Bertozzi; *Angew. Chem. Int. Ed.* 2009; **48(38):** 6974-6998. doi: 10.1002/anie.200900942.
- Bioorthogonal chemistry: strategies and recent developments. Ramil CP, Lin Q.; *Chem Commun (Camb).* 2013; **49(94):** 11007-22. doi: 10.1039/c3cc44272a.
- Biomedical Applications of Tetrazine Cycloadditions; Neal K. Devaraj and Ralph Weissleder; *Acc. Chem. Res.* 2011; **44(9):** 816-827. DOI: 10.1021/ar200037t.

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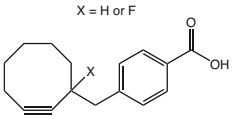
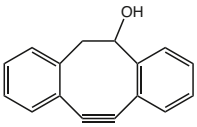
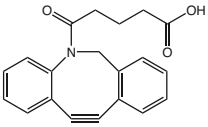
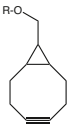
In the table below various strained cyclooctynes are depicted with their related reactivities, as determined by reaction with benzyl azide as model azide. In general, the reactivity increases through the presence of atoms with high electronegativity next to the alkyne function, i.e. good σ-acceptors.

The reactivity will also increase with increasing ring strain, as is the case for dibenzo-fused cyclooctynes (DiBO and DiBAC) and bicyclo[6.1.0]non-4-yne (BCN), whereby the cyclopropane ring is contributing to the additional strain in the latter.

				
2nd order reaction rate constant *k* [x 10^{-3} M^{-1} s^{-1}]	1.2 (R = H) 4.3 (R = F)	57	310	110

Unlike other cyclooctynes, BCN generates a single regioisomer after reaction with an azide component. It has been shown that BCN also rapidly reacts with other 1,3-dipoles such as nitril oxides and nitrones, as well as substituted 1,2,4,5-tetrazines. In terms of polarity BCN is a highly suitable reactive partner in strain-promoted cycloaddition reactions in aqueous media, as the number of functional groups or phenyl rings is reduced to a minimum, hence allowing efficient bioconjugations in biologically relevant systems.

References of applications with strained cyclooctynes:

- **Patent: WO2011136645A1**
- Imaging bacterial peptidoglycan with near-infrared fluorogenic azide probes; Peyton Shieh, M. Sloan Siegrist, Andrew J. Cullen, and Carolyn R. Bertozzi; *PNAS* 2014; **111(15):** 5456–5461. DOI: www.pnas.org/cgi/doi/10.1073/pnas.1322727111.
- Readily Accessible Bicyclononynes for Bioorthogonal Labeling and Three-Dimensional Imaging of Living Cells; Jan Dommerholt, Samuel Schmidt, Rinske Temming, Linda J. A. Hendriks, Floris P. J. T. Rutjes, Jan C. M. van Hest, Dirk J. Lefeber, Peter Friedl, and Floris L. van Delft; *Angew. Chem. Int. Ed.* 2010; **49:** 9422 –9425: DOI: 10.1002/anie.201003761.
- Aza-dibenzocyclooctynes for fast and efficient enzyme PEGylation via copper-free (3+2) cycloaddition; Marjoke F. Debets, Sander S. van Berkel, Sanne Schoffelen, Floris P. J. T. Rutjes, Jan C. M. van Hest and Floris L. van Delft; *Chem. Commun.* 2010; **46:** 97–99; DOI: 10.1039/b917797c.
- Improved synthesis and biological evaluation of chelator-modified α-MSH analogs prepared by copper-free click chemistry; Nicholas J. Baumhover, Molly E. Martin, Sharavathi G. Parameswarapp, Kyle C. Kloepping, M. Sue O'Dorisio, F. Christopher Pigge, Michael K. Schultz; *Bioorg. Med. Chem. Lett.* 2011; **21(19)**: 5757 DOI:10.1016/j.bmcl.2011.08.017.
- Synthesis of a DOTA-Biotin Conjugate for Radionuclide Chelation via Cu-Free Click Chemistry; Michael K. Schultz, Sharavathi G. Parameswarappa, and F. Christopher Pigge; *Org. Lett.* 2010; **12(10):** 2398-2401. DOI: 10.1021/ol100774p.
- Dual Labeling of Biomolecules by Using Click Chemistry: A Sequential Approach; Peter Kele, Gabor Mezö, Daniela Achatz, and Otto S. Wolfbeis; *Angew. Chem. Int. Ed.* 2009; **48:** 344 –347. DOI: 10.1002/anie.200804514.
- Clickable fluorophores for biological labeling–with or without copper; Péter Kele, Xiaohua Li, Martin Link, Krisztina Nagy, András Herner, Krisztián Lörincz, Szabolcs Béni and Otto S. Wolfbeis; *Org. Biomol. Chem.* 2009; **7:** 3486–3490. DOI: 10.1039/b907741c
- Genetic Encoding of Bicyclononynes and trans-Cyclooctenes for Site-Specific Protein Labeling in Vitro and in Live Mammalian Cells via Rapid Fluorogenic Diels-Alder Reactions; Kathrin Lang, Lloyd Davis, Stephen Wallace, Mohan Mahesh, Daniel J. Cox, Melissa L. Blackman, Joseph M. Fox, and Jason W. Chin; *J. Am. Chem. Soc.* 2012; **134:** 10317-10320. DOI: dx.doi.org/10.1021/ja302832g.
- Minimal Tags for Rapid Dual-Color Live-Cell Labeling and Super-Resolution Microscopy; Ivana Nikić, Tilman Plass, Oliver Schraidt, Jędrzej Szymański, John A. G. Briggs, Carsten Schultz, and Edward A. Lemke; *Angew. Chem. Int. Ed.* 2014; **53:** 2245 –2249. DOI: 10.1002/anie.201309847.
- Moderating Strain without Sacrificing Reactivity: Design of Fast and Tunable Noncatalyzed Alkyne-Azide Cycloadditions via Stereoelectronically Controlled Transition State Stabilization; Brian Gold, Gregory B. Dudley, and Igor V. Alabugin; *J. Am. Chem. Soc.* 2013; **135:** 1558-1569. DOI: dx.doi.org/10.1021/ja3114196.
- Kinetics studies of rapid strain-promoted [3+2] cycloadditions of nitrones with bicyclo[6.1.0]nonyne; Douglas A. MacKenzie and John Paul Pezacki; *Can. J. Chem.* 2014; **92:** 337–340. DOI: dx.doi.org/10.1139/cjc-2013-0577.

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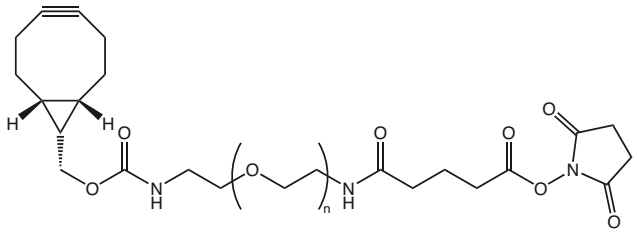
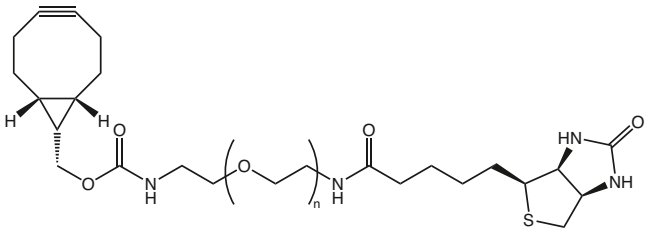
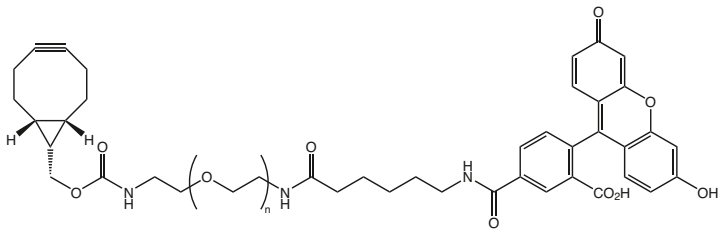
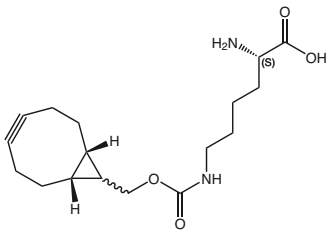
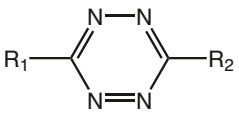
b) Custom Synthesis of BCN Derivatives and Conjugations

Use the advantages of BCN for your own application!

We offer custom synthesis of BCN and tetrazine derivatives and related conjugations.

<u>BCN-PEG Derivatives:</u> BCN-PEG-NHS BCN-PEG-NH_2 BCN-PEG-OMe With short & monodisperse or long & polydisperse PEG spacers.	
<u>BCN-PEG-Biotin:</u> With short & monodisperse or long & polydisperse PEG spacers; With hydrophobic spacers.	
<u>BCN-PEG-Dye:</u> With short & monodisperse or long & polydisperse PEG spacers; With different dyes of your choice.	
<u>BCN-Building Block Conjugates:</u> BCN analogues with Lys, Orn and other amino acids; With carbohydrates; And with any organic compound of your choice.	
<u>Tetrazine Analogues:</u> Please specify your residues!	

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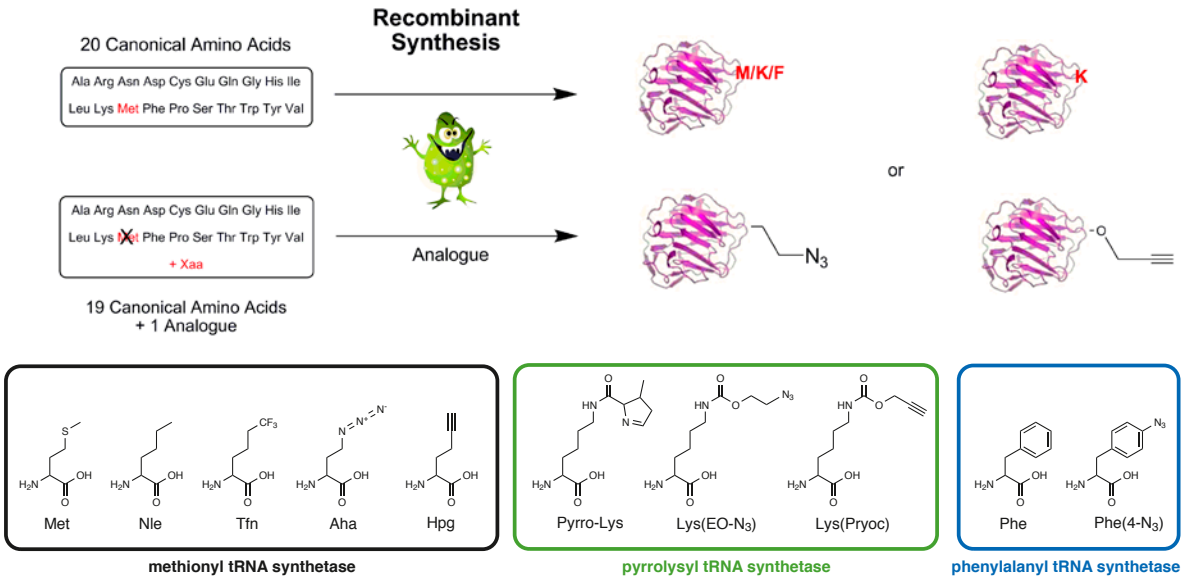
2. Applications of Amino Acids with Click Chemistry



a) Recombinant Incorporation of Amino Acids into Proteins

Mutant or modified aminoacyl tRNA synthetases (aaRS) have been used to charge non-natural amino acids to the corresponding tRNA, which incorporates them into polypeptides or proteins during recombinant synthesis. As azido homoalanine (Aha) is a structure analogue of methionine (Met), Met has been replaced effectively by Aha in proteins by the native methionyl tRNA synthetase of *E. coli*. A modified yeast phenylalanyl-tRNA synthetase was prepared by introduction of a T415G or T415A mutation in its α-subunit; specific residues in tryptophanyl-tRNA synthetase and methionyl-tRNA synthetase are also identified, where mutagenesis results in specificity for non-natural aminoacyl-tRNA molecules. tRNA can be loaded with azido and propargyl analogues of lysine by pyrrolysyl-tRNA synthetase enabling the biochemist to introduce site specifically an azido or alkyne group into a protein for further click conjugation. Further developments and inventions have been done to specifically incorporate a vast number of Click components into practically any protein.

Once the azido function has been built into the protein sequence, conjugation with a large number of diverse partners opens a wide field of possibilities. Many different applications from therapeutics to diagnostics can be addressed through conjugates with PEG-polymers, dyes, cofactors, antibodies, small molecules, toxins, additional proteins, and peptides.

References:

- Incorporation of Azides into Rrecombinant Proteins for Chemoselective Modification by the Staudinger ligation; Kristi L. Kiick, Eliana Saxon, David A. Tirrell, and Carolyn R. Bertozzi; Proc. *Natl. Acad. Sci. USA 2002;* **99**: 19.
- Patent: WO 2007103307
- High-Throughput Screening for Methionyl-tRNA Synthetases that Enable Residue-Specific Incorporation of Noncanonical Amino Acids into Recombinant Proteins in Bacterial Cells; Tae Hyeon Yoo and David A. Tirrell; *Angew. Chem. Int. Ed.* 2007; **46:** 5340–5343; DOI: 10.1002/anie.200700779.
- Global Replacement of Tryptophan with Aminotryptophans Generates Non-Invasive Protein-Based Optical pH Sensors; Nediljko Budisa, Marina Rubini, Jae H. Bae, Elisabeth Weyher, Waltraud Wenger, Ralph Golbik, Robert Huber, Luis Moroder; *Angew. Chem. Int. Ed.* 2002; **41(21):** 4066-4069.
- Genetic Encoding and Labeling of Aliphatic Azides and Alkynes in Recombinant Proteins via a Pyrrolysyl-tRNA Synthetase/tRNA(CUA) Pair and Click Chemistry; Duy P. Nguyen, Hrvoje Lusic, Heinz Neumann, Prashant B. Kapadnis, Alexander Deiters, and Jason W. Chin; *J. Am. Chem. Soc. 2009;* **131**: 8720-8721.
- Direct charging of $tRNA_{CUA}$ with pyrrolysine in vitro and in vivo; Blight Sherry et. al; *Nature* 2004; **431**: 333-335.

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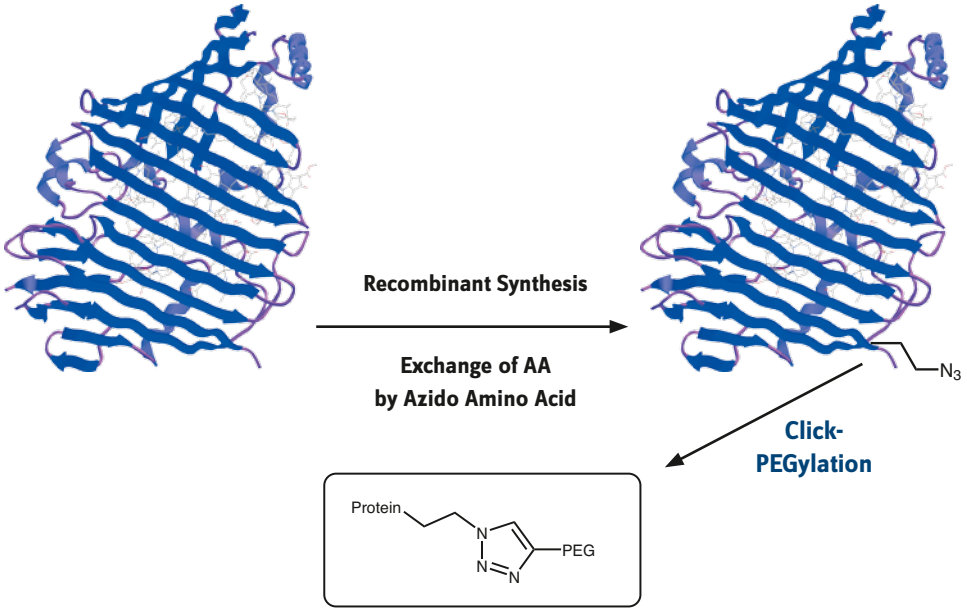
Protocol for Protein Labelling by Cycloaddition:

1. Dilute the desired proteome sample to a 2 mg/ml solution in PBS.
2. Add 500 µl of diluted 2 mg/ml proteome solution to an Eppendorf tube.
3. Add 1-20 µM of the desired alkyne probe from a concentrated DMSO stock: do not exceed 10 µl of DMSO in this 500 µl reaction. After addition of the probe, vortex and leave at room temperature for 1 h.
4. Prepare a fresh solution of 50 µM TCEP (LS-3405) in water (14.4 mg/ml) and a 1.7 mM stock of ligand in DMSO:tBuOH 1:4 (0.9 mg/ml). Store TCEP at 4°C under argon.
   Stock solution in water should always be prepared freshly.
5. Add 11.6 µl of the tag (6mM stock solution in DMSO) and vortex.
6. Add 11.6 µl of fresh TCEP solution without vortexing.
7. Add 35 µl of ligand solution and vortex.
8. Add 11.6 µl of copper (II) sulfate (50 mM stock in water (12.5 mg/ml)) and vortex.
9. Leave the tubes at room temperature for 1 h (vortex after 30 min). At this stage, the proteins will start to precipitate and the solution will turn cloudy.
10. Centrifuge for 4 min at 6,500g and 4°C. A protein pellet will form.
11. Remove the supernatant and add 500 µl of cold MeOH. Sonicate for 3-4 s. (Ensure that the MeOH used for washing the protein pellet is cooled on ice before use. The use of warm MeOH results in loss of protein from the pellet.)
12. Rotate at 4°C for 10 min and centrifuge for 4 min at 6,500g and 4°C.
13. Remove the supernatant and repeat the wash with 500 µl of cold MeOH (step 11 and 12).
14. Remove the supernatant, add 1 ml of 1.2% SDS/PBS, sonicate for 3-4 s and heat to 80-90°C for 5 min.
15. Transfer the solution to a 15 ml conical tube and dilute to 0.2% SDS with 5 ml of PBS.
16. Samples can be stored at -80°C for several days.

For more details refer to the following reference:

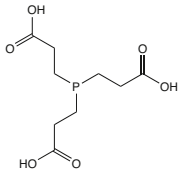
- Tandem orthogonal proteolysis-activity-based protein profiling (TOP-ABPP)-a general method for mapping sites of probe modification in proteomes; Eranthie Weerapana, Anna E. Speers and Benjamin F. Cravatt; *NATURE PROTOCOLS*, 2007; **2(6)**: 1414-1425; DOI:10.1038/nprot.2007.194.



Article No.	Quantity	Price
LS-3405.0005	5 g	€ 150,00
LS-3405.0025	25 g	€ 200,00
LS-3405.0100	100 g	€ 550,00

LS-3405 TCEP*HCl

Tris-(2-carboxyethyl)phosphine hydrochloride salt
CAS-NO: 51805-45-9
FORMULA: $C_9H_{15}O_6P*HCl$
MOLECULAR WEIGHT: 250,19*36,45 g/mole



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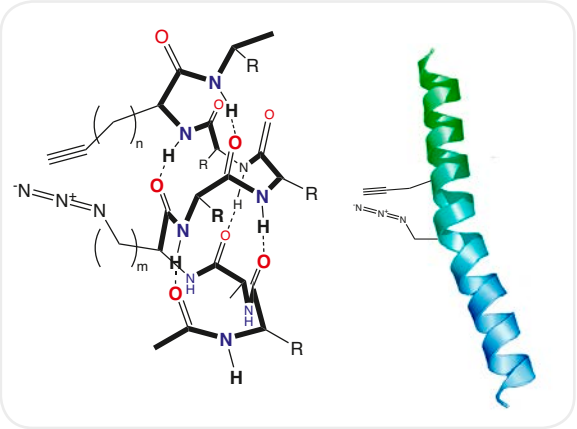
b) Peptide Synthesis with Azido and Alkyne Amino Acids



m+n = 4 or 7:
→ either non-canonial or disordered structure

m+n = 5 or 6:
→ ordered and regular secondary structure

As Boc and Fmoc protected derivatives of both azido and alkyne amino acids are available, they can be introduced into peptide sequences through standard SPPS protocols, for example. In an α-helical secondary structure amino acids at positions i and i+4 are above each other. When they carry alkyne and azido function respectively, these groups are close to each other and can undergo cycloaddition forming the corresponding 1,2,3-triazol moiety and stabilizing the secondary structure in the α-helical conformation. It has been demonstrated with nonapeptides [1,2] that whenever the 1,2,3-triazol bridge carries 5 or 6 methylene groups, the peptide shows a nice regular and ordered secondary structure. However, if the ring size is smaller (m+n= 4) or larger (m+n=7) the secondary structure is rather disordered.

Stabilization of the secondary structure also can be achieved by side chain lactam formation, for example with Lys and Asp at the appropriate positions. Azido and alkyne amino acids have, however, from synthetic and cost points of view some advantages. Using Lys and Asp orthogonal protecting groups have to be selected, which can result in a more complex process and more expensive building blocks. Azido and alkyne functions react highly specific to the 1,2,3-triazol ring. Educts and products are stable and inert at normal peptide synthesis conditions. No additional protection and related deprotection steps are required and the 1,2,3-triazol shows proteolytic stability, which is of high importance, whenever built into biological or pharmacological products.

Protocol for click reaction in peptide synthesis:

Successful protocols have been published applying to 3 µmol peptide in 4 ml tBuOH/H_2O (1:2) with excess of ascorbic acid (40 µmol) and $CuSO_4$*$5H_2O$ (40 µmol) generating Cu(I) in situ. Stirring at room temperature over night is followed by appropriate chromatographic work up. [3]

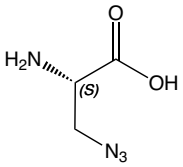
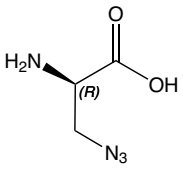
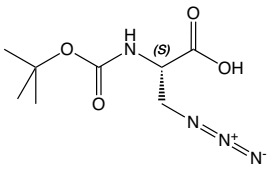
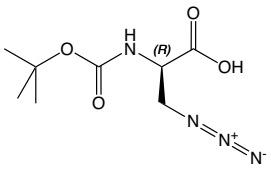
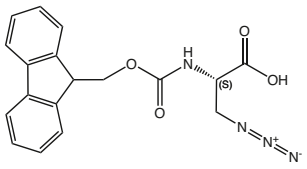
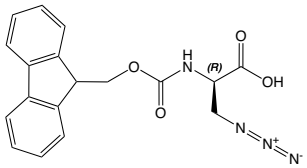
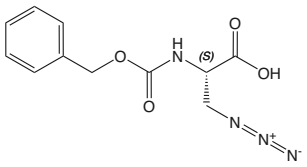
References:

- [1] Cu^{I}-Catalyzed Azide-Alkyne Intramolecular i-to-(i+4) Side-Chain-to-Side-Chain Cyclization Promotes the Formation of Helix-Like Secondary Structures; Mario Scrima, Alexandra Le Chevalier-Isaad, Paolo Rovero, Anna Maria Papini, Michael Chorev, and Anna Maria D'Ursi; Eur. *J. Org. Chem.* 2010; 446–457; DOI: 10.1002/ejoc.200901157.
- [2] Synthesis and Conformational Analysis of a Cyclic Peptide Obtained via i to i+4 Intramolecular Side-Chain to Side-Chain Azide-Alkyne 1,3-Dipolar Cycloaddition; Sonia Cantel, Alexandra Le Chevalier Isaad, Mario Scrima, Jay J. Levy, Richard D. DiMarchi, Paolo Rovero, Jose A. Halperin, Anna Maria D'Ursi, Anna Maria Papini, and Michael Chorev; *J. Org. Chem.* 2008; **73:** 5663–5674; DOI: 10.1021/jo800142s.
- [3] Side chain-to-side chain cyclization by click reaction; Alexandra Le Chevalier Isaad, Anna Maria Papini, Michael Chorev Paolo Rovero; *J. Pept. Sci.* 2009; **15**: 451–454; DOI 10.1002/psc.1141
- [4] "Click" cyclized gallium-68 labeled peptides for molecular imaging and therapy: Synthesis and preliminary in vitro and in vivo evaluation in a melanoma model system; Molly E. Martin, M. Sue O'Dorisio, Whitney M. Leverich, Kyle C. Kloepping, and Michael K. Schultz; in: *A Pathway to Personalized Diagnosis and Treatment Series: Recent Results in Cancer Research*, 2012; 194: Richard P. Baum; Frank Rösch (Editors) 2012 ISBN 978-3-642-27993-5.
- [5] Improved synthesis and biological evaluation of chelator-modified α-MSH analogs prepared by copper-free click chemistry; Nicholas J. Baumhover, Molly E. Martin, Sharavathi G. Parameswarappa, Kyle C. Kloepping, M. Sue O'Dorisio c, F. Christopher Pigge, Michael K. Schultz; *Bioorg. Med. Chem. Lett.* 2011; **21(19)**: 5757-61; DOI:10.1016/j.bmcl.2011.08.017.

Prices are in EUR, net, exw Germany

c) Azido Amino Acids

Azido-Alanine

		Article No.	Quantity	Price
HAA1880 H-L-Aza-OH*HCl (S)-2-Amino-3-azidopropanoic acid hydrochloride CAS-NO: 105661-40-3 net FORMULA: $C_3H_6N_4O_2$*HCl MOLECULAR WEIGHT: 130,11*36,45 g/mole		HAA1880.0001 HAA1880.0005 HAA1880.0025	1 g 5 g 25 g	€ 190,00 € 750,00 € 3000,00
HAA1885 H-D-Aza-OH*HCl (R)-2-Amino-3-azidopropanoic acid hydrochloride CAS-NO: 105928-88-9 net FORMULA: $C_3H_6N_4O_2$*HCl MOLECULAR WEIGHT: 130,11*36,45 g/mole		HAA1885.0001 HAA1885.0005	1 g 5 g	€ 275,00 € 950,00
BAA1820 Boc-L-Aza-OH*CHA (S)-2-t-Butyloxycarbonylamino-3-azidopropanoic acid cyclohexylamine CAS-NO: 122225-54-1 net FORMULA: $C_8H_{14}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 230,22*99,18 g/mole		BAA1820.0001 BAA1820.0005 BAA1820.0025	1 g 5 g 25 g	€ 200,00 € 750,00 € 3000,00
BAA1825 Boc-D-Aza-OH*CHA Boc-D-Aza-OH, Boc-D-beta-azidoalanine, N-alpha-t-Butyloxycarbonyl-3-azido-D-alanine, (R)-2-t-Butyloxycarbonylamino-3-azidopropanoic acid cyclohexylamine CAS-NO: 225780-77-8 net FORMULA: $C_8H_{14}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 230,22*99,18 g/mole		BAA1825.0001 BAA1825.0005 BAA1825.0025	1 g 5 g 25 g	€ 225,00 € 900,00 € 3600,00
FAA1820 Fmoc-L-Aza-OH (solv.) (S)-2-(9-Fluorenylmethyloxycarbonylamino)-3-azidopropanoic acid, solvate with DIPE CAS-NO: 684270-46-0 FORMULA: $C_{18}H_{16}N_4O_4$ MOLECULAR WEIGHT: 352,34 g/mole		FAA1820.0001 FAA1820.0005 FAA1820.0025	1 g 5 g 25 g	€ 160,00 € 600,00 € 2400,00
FAA6870 Fmoc-D-Aza-OH (R)-2-(9-Fluorenylmethyloxycarbonylamino)-3-azidopropanoic acid CAS-NO: 1016163-79-3 FORMULA: $C_{18}H_{16}N_4O_4$ MOLECULAR WEIGHT: 352,34 g/mole		FAA6870.0001 FAA6870.0005 FAA6870.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2800,00
ZAA1280 Z-L-Dap(N_3)-OH*CHA (S)-2-Benzyloxycarbonylamino-3-azidopropanoic acid cyclohexylamine CAS-NO: 684270-44-8 net FORMULA: $C_{11}H_{12}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 264,24*99,18 g/mole		ZAA1280.0001 ZAA1280.0005 ZAA1280.0025	1 g 5 g 25 g	€ 200,00 € 800,00 € 3250,00

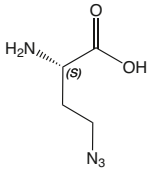
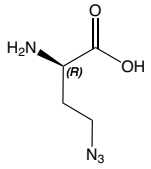
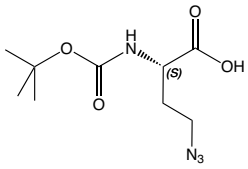
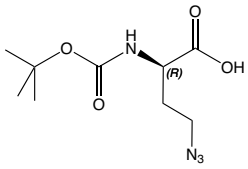
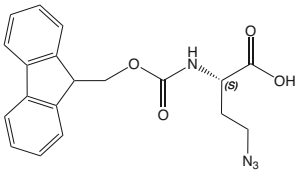
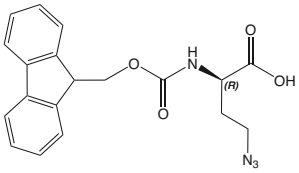
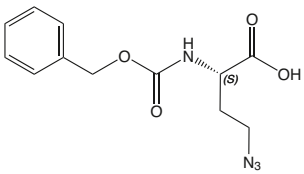
Literature with Aza:

- Mimicking of Disulfide Bonds by Triazoles; Kai Holland-Nell and Morten Meldal; in: Proceedings of the 31st European Peptide Symposium; Michal Lebl, Morten Meldal, Knud J. Jensen, Thomas Hoeg-Jensen (Editors), *European Peptide Society*, 2010; 146
- Peptide Tertiary Structure Nucleation by Side-Chain Crosslinking with Metal Complexation and Double "Click" Cycloaddition; Oscar Torres, Deniz Y'ksel, Matt Bernardina, Krishna Kumar, and Dennis Bong; *ChemBioChem* 2008; **9:** 1701-1705; DOI: 10.1002/cbic.200800040.
- "Click to Chelate": Synthesis and Installation of Metal Chelates into Biomolecules in a Single Step; Thomas L. Mindt, Harriet Struthers, Luc Brans, Todor Anguelov, Christian Schweinsberg, Veronique Maes, Dirk Tourwé, and Roger Schibli; *J. Aa. Chem. Soc.* 2006; **128:** 15096-15097; DOI: 10.1021/ja066779f.

Prices are in EUR, net, exw Germany

- Design, synthesis, and biological activity of novel triazole amino acids used to probe binding interactions between ligand and neutral amino acid transport protein SN1; Mariusz Gajewski, Ben Seaver and C. Sean Esslinger; *Bioorg. Med. Chem. Lett.* 2007; **17:** 4163-4166; DOI:10.1016/j.bmcl.2007.05.061
- Azidoalanine mutagenicity in Salmonella: effect of homologation and α-methyl substitution; Mangold, James B.; Mischke, Mark R.; LaVelle, James M.; *Mutation Research, Environmental Mutagenesis and Related Subjects* 1989; **216(1)**: 27-33.

Azido-Homoalanine

		Article No.	Quantity	Price
HAA5730 **H-L-Aha-OH*HCl** 4-Azido-L-homoalanine, (S)-2-Amino-4-azidobutanoic acid hydrochloride CAS-NO: 942518-29-8 FORMULA: $C_4H_8N_4O_2$*HCl MOLECULAR WEIGHT: 144,13*36,45 g/mole		HAA5730.0001 HAA5730.0005	1 g 5 g	€ 190,00 € 750,00
HAA1630 **H-D-Aha-OH*HCl** 4-Azido-D-homoalanine, (R)-2-Amino-4-azidobutanoic acid hydrochloride FORMULA: $C_4H_8N_4O_2$*hci MOLECULAR WEIGHT: 144,13*36.45 g/mole		HAA1630.0001 HAA1630.0005	1 g 5 g	€ 250,00 € 1000,00
BAA1800 **Boc-L-Aha-OH*CHA** Boc-L-Dab(N_3)-OH, N-alpha-t-Butyloxycarbonyl-4-azido-L-homoalanine, (S)-2-t-Butyloxycarbonylamino-4-azidobutanoic acid cyclohexylamine CAS-NO: 120042-08-2net FORMULA: $C_9H_{16}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 244,25*99,18 g/mole		BAA1800.0001 BAA1800.0005 BAA1800.0025	1 g 5 g 25 g	€ 175,00 € 700,00 € 2800,00
BAA1805 **Boc-D-Aha-OH*CHA** Boc-D-Dab(N_3)-OH, N-alpha-t-Butyloxycarbonyl-4-azido-D-homoalanine, (R)-2-t-Butyloxycarbonylamino-4-azidobutanoic acid cyclohexylamine FORMULA: $C_9H_{16}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 244,25*99,18 g/mole		BAA1805.0001 BAA1805.0005 BAA1805.0025	1 g 5 g 25 g	€ 225,00 € 900,00 € 3600,00
FAA6620 **Fmoc-L-Aha-OH** N-alpha-(9-Fluorenylmethyloxycarbonyl)-4-azido-L-homoalanine, (S)-2-(9-Fluorenylmethyloxycarbonylamino)-4-azidobutanoic acid CAS-NO: 942518-20-9 FORMULA: $C_{19}H_{18}N_4O_4$ MOLECULAR WEIGHT: 366,41 g/mole		FAA6620.0001 FAA6620.0005 FAA6620.0025	1 g 5 g 25 g	€ 145,00 € 550,00 € 2200,00
FAA6810 **Fmoc-D-Aha-OH** N-alpha-(9-Fluorenylmethyloxycarbonyl)-4-azido-D-homoalanine, (R)-2-(9-Fluorenylmethyloxycarbonylamino)-4-azidobutanoic acid CAS-NO: 1263047-53-5 FORMULA: $C_{19}H_{18}N_4O_4$ MOLECULAR WEIGHT: 366,41 g/mole		FAA6810.0001 FAA6810.0005 FAA6810.0025	1 g 5 g 25 g	€ 225,00 € 750,00 € 3000,00
ZAA5700 **Z-L-Aha-OH*DCHA** Z-L-Dab(N_3)-OH, N-alpha-Benzyloxycarbonyl-4-azido-L-homoalanine, (S)-2-Benzyloxycarbonylamino-4-azidobutanoic acid dicyclohexylamine CAS-NO: 1263047-43-3 net FORMULA: $C_{12}H_{14}N_4O_4$*$C_{12}H_{23}N$ MOLECULAR WEIGHT: 278,26*181,34 g/mole		ZAA5700.0001 ZAA5700.0005	1 g 5 g	€ 200,00 € 800,00

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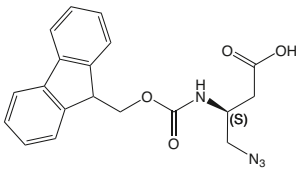
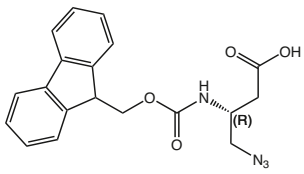
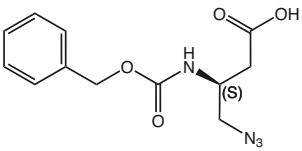
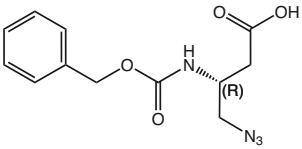
Patents with Aha:

- EP2190856 (A2), US2008096819 (A1), WO2009026393 (A2), WO2009026393 (A3), WO2006079364

Literature with Aha:

- Mild and Chemoselective Peptide-Bond Cleavage of Peptides and Proteins at Azido Homoalanine; Jaap Willem Back, Olivier David, Gertjan Kramer, Géraldine Masson, Piotr T. Kasper, Leo J. de Koning, Luitzen de Jong, Jan H. van Maarseveen, and Chris G. de Koster; *Angew. Chem. Int. Ed.* 2005; **44:** 7946–7950; DOI: 10.1002/anie.200502431.
- „Clickable" elastins: elastin-like polypeptides functionalized with azide or alkyne groups; Rosalie L. M. Teeuwen; Sander S. van Berkel; Tim H. H. van Dulmen; Sanne Schoffelen; Silvie A. Meeuwissen; Han Zuilhof; Frits A. de Wolf; Jan C. M. van Hest; *Chemical Communications* 2009; **27:** 4022-4024.
- Selective Enrichment of Azide-Containing Peptides from Complex Mixtures; Merel A. Nessen; Gertjan Kramer; Jaap Willem Back; Jeremy M. Baskin; Linde E. J. Smeenk; Leo J. de Koning; Jan H. van Maarseveen; Luitzen de Jong; Carolyn R. Bertozzi; Henk Hiemstra *et al.; Journal of Proteome Research* 2009; **8(7):** 3702-3711.
- Site-Specific Modification of Candida antarctica Lipase B via Residue-Specific Incorporation of a Non-Canonical Amino Acid; Sanne Schoffelen; Mark H. L. Lambermon; Mark B. van Eldijk; Jan C. M. van Hest; *Bioconjugate Chemistry* 2008; **19(6):** 1127-1131.
- Unnatural Amino Acid Incorporation into Virus-Like Particles; Erica Strable; Duane E. Prasuhn; Andrew K. Udit; Steven Brown; A. James Link; John T. Ngo; Gabriel Lander; Joel Quispe; Clinton S. Potter; Bridget Carragher *et al.; Bioconjugate Chemistry* 2008; **19(4):** 866-875.
- Preparation of the functionalizable methionine surrogate azidohomoalanine via copper-catalyzed diazo transfer; A. James Link; Mandy K. S. Vink; David A. Tirrell; *Nature Protocols* 2007; **2(8):** 1879-1883.
- Synthesis of the functionalizable methionine surrogate azidohomoalanine using Boc-homoserine as precursor; A. James Link; Mandy K. S. Vink; David A. Tirrell; *Nature Protocols* 2007; **2(8):** 1884-1887.
- Presentation and detection of azide functionality in bacterial cell surface proteins; A. James Link; Mandy K. S. Vink; David A. Tirrell; *J. Am. Chem. Soc.* 2004; **126(34):** 10598-10602.
- Expanding the diversity of chemical protein modification allows post-translational mimicry; Sander I. van Kasteren, Holger B. Kramer, Henrik H. Jensen, Sandra J. Campbell, Joanna Kirkpatrick, Neil J. Oldham, Daniel C. Anthony, Benjamin G. Davis; *Nature* 2007; **446(26):** 1105-1109; DOI:10.1038/nature05757.

Azido-beta-Homoalanine

		Article No.	Quantity	Price
FAA2035	**Fmoc-L-Dbu(N_3)-OH**	FAA2035.0001	1 g	€ 200,00
(S)-3-(9-Fluorenylmethyloxycarbonyl)amino-4-azido-butanoic acid		FAA2035.0005	5 g	€ 750,00
CAS-NO: 934502-72-4		FAA2035.0025	25 g	€ 3000,00
FORMULA: $C_{19}H_{18}N_4O_4$				
MOLECULAR WEIGHT: 366,37 g/mole				
FAA3650	**Fmoc-D-Dbu(N_3)-OH**	FAA3650.0001	1 g	€ 275,00
(R)-3-(9-Fluorenylmethyloxycarbonyl)amino-4-azido-butanoic acid		FAA3650.0005	5 g	€ 1000,00
FORMULA: $C_{19}H_{18}N_4O_4$				
MOLECULAR WEIGHT: 366,37 g/mole				
ZAA1290	**Z-L-Dbu(N_3)-OH**	ZAA1290.0001	1 g	€ 350,00
(S)-3-(Benzyloxycarbonyl)amino-4-azido-butanoic acid		ZAA1290.0005	5 g	€ 1400,00
FORMULA: $C_{12}H_{14}N_4O_4$				
MOLECULAR WEIGHT: 278,26 g/mole				
ZAA1285	**Z-D-Dbu(N_3)-OH**	ZAA1285.0001	1 g	€ 300,00
(R)-3-(Benzyloxycarbonyl)amino-4-azido-butanoic acid		ZAA1285.0005	5 g	€ 1200,00
FORMULA: $C_{12}H_{14}N_4O_4$				
MOLECULAR WEIGHT: 278,26 g/mole				

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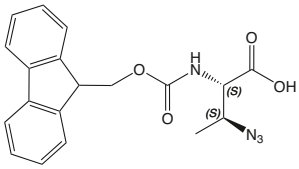
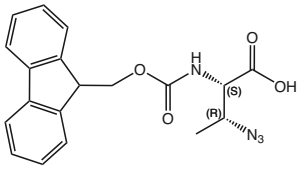
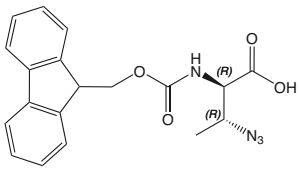
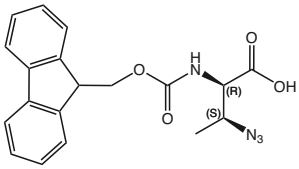
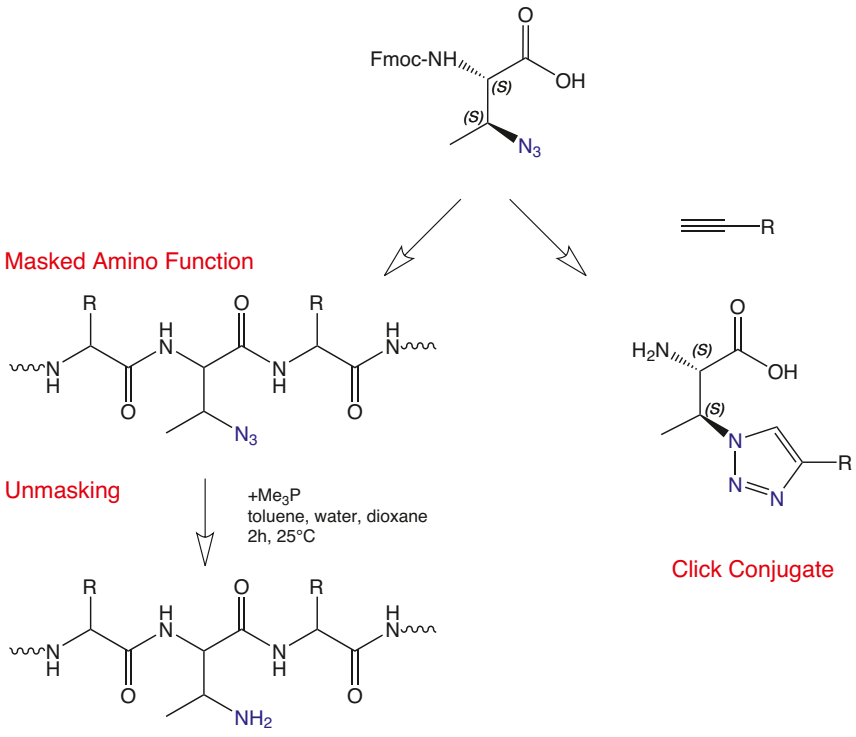
2-Amino-3-Azido-Butanoic Acid

		Article No.	Quantity	Price
FAA2040	**Fmoc-Abu(3-N_3)-OH (2S,3S)**	FAA2040.0001	1 g	€ 240,00
(2S,3S)-2-(9-Fluorenylmethyloxycarbonyl)amino-3-azido-butanoic acid CAS-NO: 131669-42-6 FORMULA: $C_{19}H_{18}N_4O_4$ MOLECULAR WEIGHT: 366,37 g/mole		FAA2040.0005	5 g	€ 900,00
		FAA2040.0025	25 g	€ 3000,00
FAA3200	**Fmoc-Abu(3-N_3)-OH (2S,3R)**	FAA3200.0250	250 mg	€ 200,00
(2S,3R)-2-(9-Fluorenylmethyloxycarbonyl)amino-3-azido-butanoic acid CAS-NO: 146306-79-8 FORMULA: $C_{19}H_{18}N_4O_4$ MOLECULAR WEIGHT: 366,37 g/mole		FAA3200.1000	1 g	€ 550,00
		FAA3200.5000	5 g	€ 2200,00
FAA2095	**Fmoc-Abu(3-N_3)-OH (2R,3R)**	FAA2095.0001	1 g	€ 250,00
(2R,3R)-2-(9-Fluorenylmethyloxycarbonyl)amino-3-azido-butanoic acid CAS-NO: 1229394-75-5 FORMULA: $C_{19}H_{18}N_4O_4$ MOLECULAR WEIGHT: 366,37 g/mole		FAA2095.0005	5 g	€ 1000,00
FAA3540	**Fmoc-Abu(3-N_3)-OH (2R,3S)**	FAA3540.0250	250 mg	€ 350,00
(2R,3S)-2-(9-Fluorenylmethyloxycarbonyl)amino-3-azido-butanoic acid FORMULA: $C_{19}H_{18}N_4O_4$ MOLECULAR WEIGHT: 366,37 g/mole		FAA3540.1000	1 g	€ 1000,00
		FAA3540.5000	5 g	€ 4000,00

Azido-Masked Amino Function

The azido function in 2-amino-3-azidobutanoic acid can be used for different applications:



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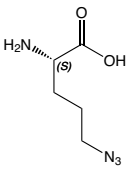
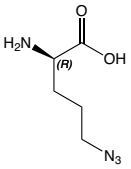
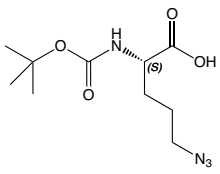
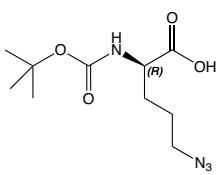
1. The azido group can be reduced to an amino function and hereby serve as masked amino group. It is of particular use if additional orthogonalities are needed. Azido is stable towards treatment with piperidine (Fmoc deprotection), Pd(0) (Alloc removal) and acidic treatmet (cleavage of Mtt, Trt or other acid sensitive groups). However, as it is a pseudohalogenide, care has to be taken during coupling steps, as HATU will cause high racemization. This can be avoided using collidine or other non-nucleophilic bases instead of DIPEA.
2. Certainly 2-amino-3-azidobutanoic acid can be used for any type of click conjugation with any available alkynyl residue forming Diels-Alder conjugates of peptides or any other organic molecule.
3. Chiral α,β-diamines and diamino acids have become an increasing targeted functional motif in organic synthesis owing to their ubiquity in natural products and medicinal agents. For example, it is found in biotin, penicillins, and antiinfluenza neuraminidase inhibitor Tamiflu. Chiral vicinal diamines and their metal complexes have been employed in stereoselective organic synthesis, in particular, as chiral auxiliaries and ligands in catalytic asymmetric synthesis.

References:

- α,β-Diamino Acids: Biological Significance and Synthetic Approaches; Alma Viso, Roberto Fernández de la Pradilla, Ana García, and Aida Flores; *Chemical Reviews* 2005; **105(8)**: 3167-3196. DOI: 10.1021/cr0406561.
- Update 1 of: α,β -Diamino Acids: Biological Significance and Synthetic Approaches; Alma Viso, Roberto Fernández de la Pradilla, Mariola Tortosa, Ana García, and Aida Flores; *Chem. Rev.* 2011; **111**: PR1–PR42. DOI 10.1021/cr100127y.
- Orthogonally Protected Cyclo-ß-tertapeptides as Solid-Supported Scaffolds for the Synthesis of Glycoclusters; Pasi Virta, Marika Karskela, Harri Lönnberg; *J.Org.Chem* 2006; **71**: 1989-1999.
- Stereocontrolled Route to Vicinal Diamines by [3.3] Sigmatropic Rearrangement of Allyl Cyanate: Asymmetric Synthesis of anti-(2R,3R)-and syn-(2R,3S)-2,3-Diaminobutanoic Acids; Yoshiyasu Ichikawa, Haruka Egawa, Takashi Ito, Minoru Isobe, Keiji Nakano, and Hiyoshizo Kotsuki; *Org.Lett.* 2006; **8(25)**: 5737-5740.
- Efficient Synthesis of orthogonally protected *anti*-2,3-diamino acids; Stefania Capone, Annalisa Guaregna, Giovanni Palumbo, Silvana Pedatella; *Tetrahedron* 2005; **61**: 6575-6579.

Azido-Ornithine

		Article No.	Quantity	Price
HAA1620 **H-L-Orn(N_3)-OH*HCl** delta-Azido-L-ornithine hydrochloride, delta-Azido-L-norvaline hydrochloride, (S)-2-Amino-5-azidopentanoic acid hydrochloride CAS-NO: 156463-09-1net FORMULA: $C_5H_{10}N_4O_2$*HCl MOLECULAR WEIGHT: 158,16*36,45 g/mole		HAA1620.0001 HAA1620.0005 HAA1620.0025	1 g 5 g 25 g	€ 225,00 € 900,00 € 3600,00
HAA1895 **H-D-Orn(N_3)-OH*HCl** N-delta-Azido-D-ornithine, N-delta-Azido-D-norvaline, (R)-2-Amino-5-azidopentanoic acid hydrochloride FORMULA: $C_5H_{10}N_4O_2$*HCl MOLECULAR WEIGHT: 158,16*36,45 g/mole		HAA1895.0001 HAA1895.0005	1 g 5 g	€ 250,00 € 1000,00
BAA1830 **Boc-L-Orn(N_3)-OH*CHA** N-alpha-t-Butyloxycarbonyl-delta-azido-L-ornithine, N-alpha-t-Butyloxycarbonyl-delta-azido-L-norvaline, (S)-2-t-Butyloxycarbonyl-amino-5-azidopentanoic acid CAS-NO: 763139-35-1net FORMULA: $C_{10}H_{18}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 258,27*99,18 g/mole		BAA1830.0001 BAA1830.0005 BAA1830.0025	1 g 5 g 25 g	€ 175,00 € 600,00 € 2400,00
BAA1835 **Boc-D-Orn(N_3)-OH*CHA** N-alpha-t-Butyloxycarbonyl-delta-azido-D-ornithine, N-alpha-t-Butyloxycarbonyl-delta-azido-D-norvaline, (R)-2-t-Butyloxy-carbonylamino-5-azidopentanoic acid FORMULA: $C_{10}H_{18}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 258,27*99,18 g/mole		BAA1835.0001 BAA1835.0005 BAA1835.0025	1 g 5 g 25 g	€ 225,00 € 900,00 € 3600,00

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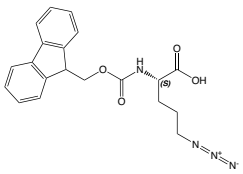
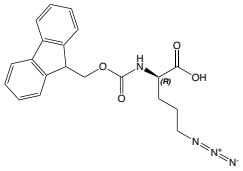
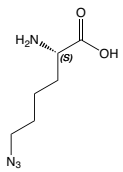
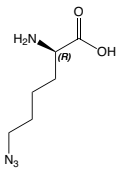
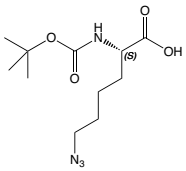
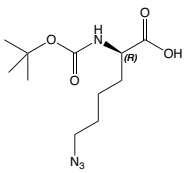
		Article No.	Quantity	Price
FAA6880 Fmoc-L-Orn(N_3)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-delta-azido-L-ornithine, N-alpha-(9-Fluorenylmethyloxycarbonyl)-delta-azido-L-norvaline, (S)-2-(9-Fluoren-ylmethyloxycarbonylamino)-5-azidopentanoic acid CAS-NO: 1097192-04-5 FORMULA: $C_{20}H_{20}N_4O_4$ MOLECULAR WEIGHT: 380,4 g/mole		FAA6880.0001 FAA6880.0005 FAA6880.0025	1 g 5 g 25 g	€ 160,00 € 600,00 € 2400,00
FAA6890 Fmoc-D-Orn(N_3)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-delta-azido-D-ornithine, N-alpha-(9-Fluorenylmethyloxycarbonyl)-delta-azido-D-norvaline, (R)-2-(9-Fluoren-ylmethyloxycarbonylamino)-5-azidopentanoic acid CAS-NO: 1176270-25-9 FORMULA: $C_{20}H_{20}N_4O_4$ MOLECULAR WEIGHT: 380,4 g/mole		FAA6890.0001 FAA6890.0005 FAA6890.0025	1 g 5 g 25 g	€ 225,00 € 750,00 € 3000,00

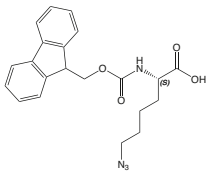
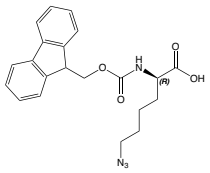
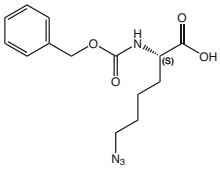
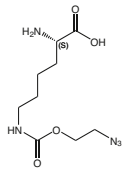
Literature with Orn(N_3):

- Application of Metal-Free Triazole Formation in the Synthesis of Cyclic RGD-DTPA Conjugates; Sander S. van Berkel, A. (Ton) J. Dirks, Silvie A. Meeuwissen, Dennis L. L. Pingen, Otto C. Boerman, Peter Laverman, Floris L. van Delft, Jeroen J. L. M. Cornelissen, and Floris P. J. T. Rutjes; *ChemBioChem* 2008; **9:** 1805-1815; DOI: 10.1002/cbic.200800074.

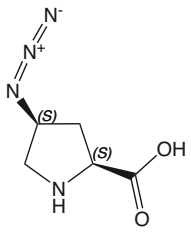
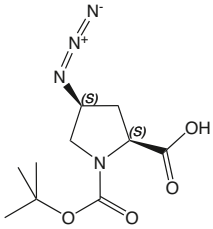
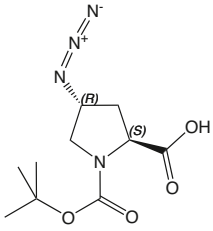
Azido-Lysine

		Article No.	Quantity	Price
HAA1625 H-L-Lys(N_3)-OH*HCl N-epsilon-Azido-L-lysine, N-epsilon-Azido-L-norleucine, (S)-2-Amino-6-azidohexanoic acid hydrochloride CAS-NO: 159610-92-1net FORMULA: $C_6H_{12}N_4O_2$*HCl MOLECULAR WEIGHT: 172,19*36,45 g/mole		HAA1625.0001 HAA1625.0005	1 g 5 g	€ 190,00 € 750,00
HAA1890 H-D-Lys(N_3)-OH*HCl N-epsilon-Azido-D-lysine, N-epsilon-Azido-D-norleucine, (R)-2-Amino-6-azidohexanoic acid hydrochloride CAS-NO: 1159610-92-1, net FORMULA: $C_6H_{12}N_4O_2$*HCl MOLECULAR WEIGHT: 172,19*36,45 g/mole		HAA1890.0001 HAA1890.0005	1 g 5 g	€ 250,00 € 1000,00
BAA1810 Boc-L-Lys(N_3)-OH*CHA N-alpha-t-Butyloxycarbonyl-epsilon-azido-L-lysine, N-alpha-t-Butyloxycarbonyl-epsilon-azido-L-norleucine, (S)-2-t-Butyloxycarbonylamino-6-azidohexanoic acid cyclohexylamine CAS-NO: 846549-33-5net FORMULA: $C_{11}H_{20}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 272,30*99,18 g/mole		BAA1810.0001 BAA1810.0005 BAA1810.0025	1 g 5 g 25 g	€ 110,00 € 450,00 € 1800,00
BAA1815 Boc-D-Lys(N_3)-OH*CHA N-alpha-t-Butyloxycarbonyl-epsilon-azido-D-lysine, N-alpha-t-Butyloxycarbonyl-epsilon-azido-D-norleucine, (R)-2-t-Butyloxy-carbonylamino-6-azidohexanoic acid cyclohexylamine FORMULA: $C_{11}H_{20}N_4O_4$*$C_6H_{13}N$ MOLECULAR WEIGHT: 272,30*99,18 g/mole		BAA1815.0001 BAA1815.0005 BAA1815.0025	1 g 5 g 25 g	€ 225,00 € 800,00 € 3200,00

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
FAA1793 Fmoc-L-Lys(N_3)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-epsilon-azido-L-lysine, N-alpha-(9-Fluorenylmethyloxycarbonyl)-epsilon-azido-L-norleucine, (S)-2-(9-Fluorenylmethyloxycarbonylamino)-6-azidohexanoic acid CAS-NO: 159610-89-6 FORMULA: $C_{21}H_{22}N_4O_4$ MOLECULAR WEIGHT: 394,42 g/mole		FAA1793.0001 FAA1793.0005 FAA1793.0025	1 g 5 g 25 g	€ 145,00 € 550,00 € 2200,00
FAA1835 Fmoc-D-Lys(N_3)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-epsilon-azido-D-lysine, N-alpha-(9-Fluorenylmethyloxycarbonyl)-epsilon-azido-D-norleucine, (R)-2-(9-Fluorenylmethyloxycarbonylamino)-6-azidohexanoic acid CAS-NO: 1198791-53-5 FORMULA: $C_{21}H_{22}N_4O_4$ MOLECULAR WEIGHT: 394,42 g/mole		FAA1835.0001 FAA1835.0005 FAA1835.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2800,00
ZAA1295 Z-L-Lys(N_3)-OH N-alpha-Benzyloxycarbonyl-epsilon-azido-L-lysine FORMULA: $C_{14}H_{18}N_4O_4*C_6H_{13}N$ MOLECULAR WEIGHT: 306,32*99,18 g/mole		ZAA1295.0001 ZAA1295.0005 ZAA1295.0025	1 g 5 g 25 g	€ 125,00 € 350,00 € 1400,00
HAA2080 H-L-Lys(EO-N_3)-OH (S)-2-amino-6-((2-azidoethoxy)carbonylamino)hexanoic acid FORMULA: $C_9H_{17}N_5O_4$ MOLECULAR WEIGHT: 259,26 g/mole		HAA2080.0001 HAA2080.0005 HAA2080.0025	1 g 5 g 25 g	€ 525,00 € 725,00 € 1025,00

Azido-Proline

		Article No.	Quantity	Price
HAA2125 H-L-Pro(4-N_3)-OH*HCl (2S,4S) (2S,4S)-4-Azido-2-carboxylic acid hydrochloride CAS-NO: 892128-58-4 FORMULA: $C_5H_8N_4O_2*HCl$ MOLECULAR WEIGHT: 156,14*36,45 g/mole		HAA2125.0001 HAA2125.0005	1 g 5 g	€ 250,00 € 900,00
BAA1905 Boc-L-Pro(4-N_3)-OH (2S,4S) cis-N-alpha-(t-Butyloxycarbonyl)-4-azido-L-proline CAS-NO: 132622-65-2 FORMULA: $C_{10}H_{16}N_4O_4$ MOLECULAR WEIGHT: 256,26 g/mole		BAA1905.0001 BAA1905.0005 BAA1905.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2800,00
BAA1930 Boc-L-Pro(4-N_3)-OH*DCHA (2S,4R) trans-N-alpha-(t-Butyloxycarbonyl)-4-azido-L-proline dicyclohexylamine CAS-NO: 132622-68-5 net FORMULA: $C_{10}H_{16}N_4O_4*C_{12}H_{23}N$ MOLECULAR WEIGHT: 256,26*181,32 g/mole		BAA1930.0001 BAA1930.0005 BAA1930.0025	1 g 5 g 25 g	€ 225,00 € 800,00 € 3200,00

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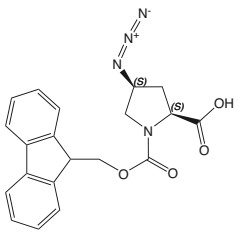
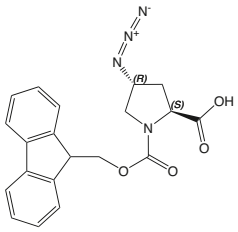
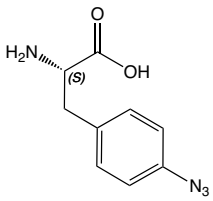
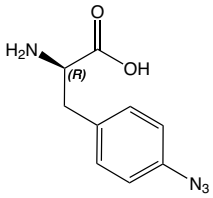
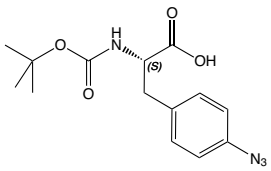
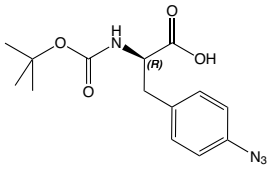
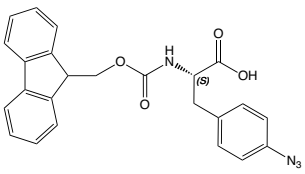
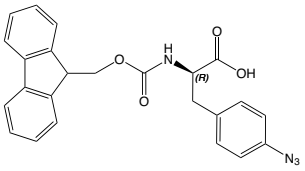
		Article No.	Quantity	Price
FAA2050	**Fmoc-L-Pro(4-N_3)-OH (2S,4S)**	FAA2050.0001	1 g	€ 250,00
cis-N-alpha-(9-Flourenylmethyloxycarbonyl)-4-azido-L-proline CAS-NO: 263847-08-1 FORMULA: $C_{20}H_{18}N_4O_4$ MOLECULAR WEIGHT: 378,38 g/mole		FAA2050.0005	5 g	€ 900,00
FAA3000	**Fmoc-L-Pro(4-N_3)-OH (2S,4R)**	FAA3000.0001	1 g	€ 300,00
trans-N-alpha-(9-Fluorenylmethyloxycarbonyl)-4-azido-L-proline CAS-NO: 702679-55-8 FORMULA: $C_{20}H_{18}N_4O_4$ MOLECULAR WEIGHT: 378,38 g/mole		FAA3000.0005	5 g	€ 1200,00

Azido-Phenylalanine

		Article No.	Quantity	Price
HAA1850	**H-L-Phe(4-N_3)-OH**	HAA1850.0001	1 g	€ 300,00
4-Azido-L-phenylalanine CAS-NO: 33173-53-4 FORMULA: $C_9H_{10}N_4O_2$ MOLECULAR WEIGHT: 206,20 g/mole		HAA1850.0005	5 g	€ 1200,00
HAA1855	**H-D-Phe(4-N_3)-OH**	HAA1855.0001	1 g	€ 425,00
4-Azido-D-phenylalanine FORMULA: $C_9H_{10}N_4O_2$ MOLECULAR WEIGHT: 206,20 g/mole		HAA1855.0005	5 g	€ 1600,00
BAA1850	**Boc-L-Phe(4-N_3)-OH**	BAA1850.0001	1 g	€ 275,00
N-alpha-t-Butyloxycarbonyl-4-azido-L-phenylalanine CAS-NO: 33173-55-6 FORMULA: $C_{14}H_{18}N_4O_4$ MOLECULAR WEIGHT: 306,32 g/mole		BAA1850.0005	5 g	€ 950,00
BAA1855	**Boc-D-Phe(4-N_3)-OH**	BAA1855.0001	1 g	€ 375,00
N-alpha-t-Butyloxycarbonyl-4-azido-D-phenylalanine CAS-NO: 214630-05-4 FORMULA: $C_{14}H_{18}N_4O_4$ MOLECULAR WEIGHT: 306,32 g/mole		BAA1855.0005	5 g	€ 1300,00
FAA1905	**Fmoc-L-Phe(4-N_3)-OH**	FAA1905.0001	1 g	€ 300,00
N-alpha-(9-Fluorenylmethyloxycarbonyl)-4-azido-L-phenylalanine CAS-NO: 163217-43-4 FORMULA: $C_{24}H_{20}N_4O_4$ MOLECULAR WEIGHT: 428,44 g/mole		FAA1905.0005	5 g	€ 975,00

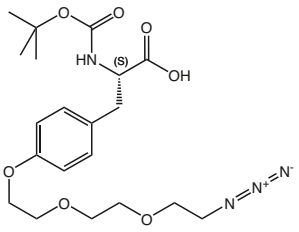
Prices are in EUR, net, exw Germany

	Article No.	Quantity	Price
FAA1910 Fmoc-D-Phe(4-N_3)-OH	FAA1910.0001	1 g	€ 400,00
N-alpha-(9-Fluorenylmethyloxycarbonyl)-4-azido-D-phenylalanine FORMULA: $C_{24}H_{20}N_4O_4$ MOLECULAR WEIGHT: 428,44 g/mole	FAA1910.0005	5 g	€ 1400,00



Azido-Tyrosine

	Article No.	Quantity	Price
BAA2235 Boc-L-Tyr(PEG(3)-N_3)-OH*DCHA	BAA2235.0001	1 g	€ 250,00
N-alpha-t-Butyloxycarbonyl-O-(2-(2-(2-azidoethoxy)ethoxy)ethyl)-L-tyrosine dicyclohexylamine FORMULA: $C_{20}H_{30}N_4O_7*C_{12}H_{23}N$ MOLECULAR WEIGHT: 438,47*181,32 g/mole	BAA2235.0005	5 g	€ 1000,00

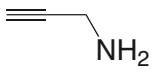


Literature using different Fmoc-Aaa(N_3)-OH for peptide synthesis:

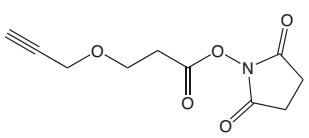
- Improved Solid-Phase Peptide Synthesis Method Utilizing r-Azide-Protected Amino Acids; Joseph T. Lundquist, IV and Jeffrey C. Pelletier; *Organic Lett.* 2001; **3(5):** 781-783.
- Azide reduction during peptide cleavage from solid-support - the choice of thio scavenger? P.E. Schneggenburger, B. Worbs, U. Diederichsen; *J.Pept.Sci.* 2010; **16(1):** 10-14.
- Patent Publ. No. WO/2005/116643; Identification of compounds modifying a cellular response; Morton Meldal *et al.* (2005).
- A DOTA-peptide conjugate by copper-free click chemistry; Molly E. Martin, Sharavathi G. Parameswarappa, M. Sue O'Dorisio, F. Christopher Pigge, Michael K. Schultz; *Bioorg. Med. Chem. Lett.* 2010; **20:** 4805-4807.
- CuI-Catalyzed Azide–Alkyne Intramolecular *i*-to-(*i*+4) Side-Chain-to-Side-Chain Cyclization Promotes the Formation of Helix-Like Secondary Structures; Mario Scrima, Alexandra Le Chevalier-Isaad, Paolo Rovero, Anna Maria Papini, Michael Chorev, and Anna Maria D'Ursi; Eur. *J. Org. Chem.* 2010; 446–457; DOI: 10.1002/ejoc.200901157.
- Synthesis and Conformational Analysis of a Cyclic Peptide Obtained via i to i+4 Intramolecular Side-Chain to Side-Chain Azide-Alkyne 1,3-Dipolar Cycloaddition; Sonia Cantel, Alexandra Le Chevalier Isaad, Mario Scrima, Jay J. Levy, Richard D. DiMarchi, Paolo Rovero, Jose A. Halperin, Anna Maria D'Ursi, Anna Maria Papini, and Michael Chorev; *J. Org. Chem.* 2008; **73:** 5663–5674; DOI: 10.1021/jo800142s.
- Side chain-to-side chain cyclization by click reaction; Alexandra Le Chevalier Isaad, Anna Maria Papini, Michael Chorev and Paolo Rovero; *J. Pept. Sci.* 2009**; 15:** 451–454; DOI 10.1002/psc.1141
- An efficient peptide ligation using azido-protected peptides via the thioester method; Hidekazu Katayama, Hironobu Hojo, Tsuyoshi Ohira, Yoshiaki Nakahara; *Tetrahedron Letters* 2008; **49(38):** 5492–5494.

d) Alkyne Amino Acids and Related Derivatives

	Article No.	Quantity	Price
PEG2755 Propargyl amine	PEG2755.0005	5 g	€ 175,00
Propargyl amine CAS-NO: 2450-71-7 FORMULA: C_3H_5N MOLECULAR WEIGHT: 55,08 g/mole	PEG2755.0025	25 g	€ 350,00



PEG1935 Propargyl-NHS	PEG1935.0100	100 mg	€ 150,00
3-(Prop-2-ynyloxy)propanoic acid succinimidyl ester CAS-NO: 1174157-65-3 FORMULA: $C_{10}H_{11}NO_5$ MOLECULAR WEIGHT: 225,2 g/mole	PEG1935.0001	1 g	€ 490,00

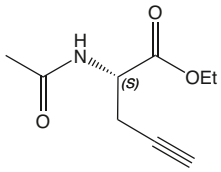


Prices are in EUR, net, exw Germany

Propargylglycine

AAA1937 Ac-L-Pra-OEt

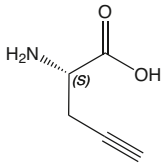
N-alpha-Acetyl-L-propargylglycine ethyl ester
FORMULA: $C_9H_{13}NO_3$
MOLECULAR WEIGHT: 183,2 g/mole



AAA1937.0001	1 g	€	240,00
AAA1937.0005	5 g	€	675,00

HAA7151 H-L-Pra-OH

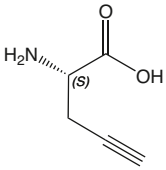
L-Propargylglycine
CAS-NO: 23235-01-0
FORMULA: $C_5H_7NO_2$
MOLECULAR WEIGHT: 113,11 g/mole



HAA7151.0001	1 g	€	250,00
HAA7151.0005	5 g	€	800,00

HAA7150 H-L-Pra-OH*HCl

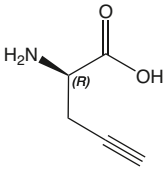
L-Propargylglycine hydrochloride
CAS-NO: 23235-01-0net
FORMULA: $C_5H_7NO_2$*HCl
MOLECULAR WEIGHT: 113,11*36,45 g/mole



HAA7150.0001	1 g	€	225,00
HAA7150.0005	5 g	€	800,00

HAA6490 H-D-Pra-OH*HCl

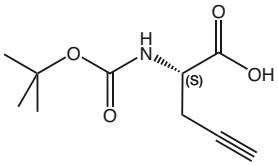
D-Propargylglycine hydrochloride
CAS-NO: 23235-03-2
FORMULA: $C_5H_8NO_2$*HCl
MOLECULAR WEIGHT: 113,11*36,45 g/mole



HAA6490.0001	1 g	€	375,00
HAA6490.0005	5 g	€	900,00

BAA1434 Boc-L-Pra-OH*DCHA

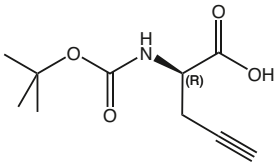
N-alpha-(t-Butyloxycarbonyl)-L-propargylglycine dicyclohexylamine
CAS-NO: 63039-49-6
FORMULA: $C_{10}H_{15}NO_4$*$C_{12}H_{23}N$
MOLECULAR WEIGHT: 213,23*181,32 g/mole



BAA1434.0001	1 g	€	175,00
BAA1434.0005	5 g	€	550,00

BAA1377 Boc-D-Pra-OH*DCHA

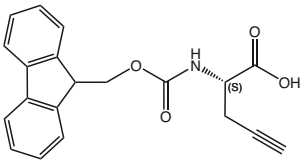
N-alpha-t-Butyloxycarbonyl-D-propargylglycine dicyclohexylamine
CAS-NO: 63039-47-4
FORMULA: $C_{10}H_{15}NO_4$*$C_{12}H_{23}N$
MOLECULAR WEIGHT: 213,23*181,32 g/mole



BAA1377.0001	1 g	€	175,00
BAA1377.0005	5 g	€	550,00

FAA1589 Fmoc-L-Pra-OH

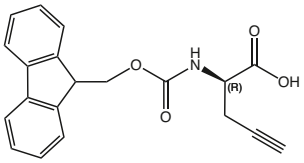
N-alpha-(9-Fluorenylmethyloxycarbonyl)-L-propargylglycine,
(S)-2-(Fmoc-amino)-4-pentynoic acid
CAS-NO: 198561-07-8
FORMULA: $C_{20}H_{17}NO_4$
MOLECULAR WEIGHT: 335,35 g/mole



FAA1589.0001	1 g	€	200,00
FAA1589.0005	5 g	€	750,00

FAA1690 Fmoc-D-Pra-OH

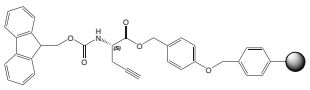
N-alpha-(9-Fluorenylmethyloxycarbonyl)-D-propargylglycine
CAS-NO: 220497-98-3
FORMULA: $C_{20}H_{17}NO_4$
MOLECULAR WEIGHT: 335,36 g/mole



FAA1690.0001	1 g	€	200,00
FAA1690.0005	5 g	€	750,00

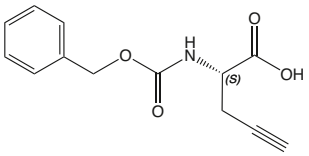
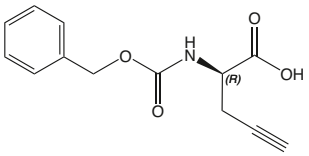
WAA6025 Fmoc-L-Pra-Wang Resin

Fmoc-L-Propargylglycine-Wang Resin (100-200 mesh, 1% DVB)

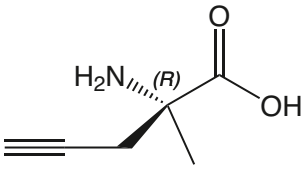
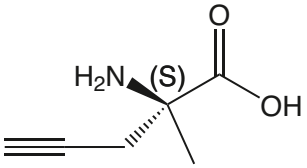
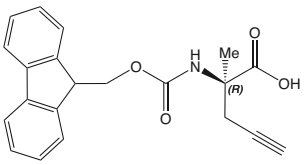
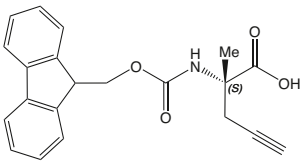


WAA6025.0001	1 g	€	175,00
WAA6025.0005	5 g	€	600,00

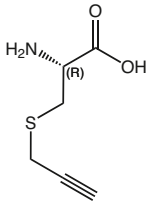
Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
ZAA1240 **Z-L-Pra-OH**		ZAA1240.0001	1 g	€ 250,00
N-alpha-Benzyloxycarbonyl-L-propargylglycine FORMULA: $C_{13}H_{13}NO_4$ MOLECULAR WEIGHT: 246,96 g/mole		ZAA1240.0005	5 g	€ 750,00
ZAA1210 **Z-D-Pra-OH*DCHA**		ZAA1210.0001	1 g	€ 220,00
N-alpha-Benzyloxycarbonyl-D-propargylglycine dicyclohexylamine FORMULA: $C_{13}H_{13}NO_4*C_{12}H_{23}N$ MOLECULAR WEIGHT: 246,96*181,32 g/mole		ZAA1210.0005	5 g	€ 650,00

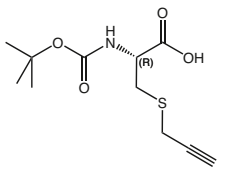
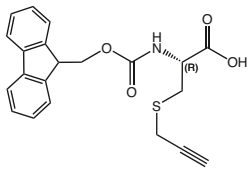
Propargylalanine

		Article No.	Quantity	Price
HAA5500 **H-alpha-Prg-L-Ala-OH**		HAA5500.0001	1 g	€ 750,00
(R)-a-Propargylalanine, (R)-2-Amino-2-methyl-4-pentynoic acid (>98%, >98%ee) CAS-NO: 403519-98-2 FORMULA: $C_6H_9NO_2$ MOLECULAR WEIGHT: 127,14 g/mole		HAA5500.0005	5 g	€ 2800,00
HAA5510 **H-alpha-Prg-D-Ala-OH**		HAA5510.0001	1 g	€ 750,00
(S)-a-Propargylalanine, (S)-2-Amino-2-methyl-4-pentynoic acid (>98%, >98%ee) CAS-NO: 1231709-27-5 FORMULA: $C_6H_9NO_2$ MOLECULAR WEIGHT: 127,14 g/mole		HAA5510.0005	5 g	€ 2800,00
FAA2070 **Fmoc-alpha-Prg-L-Ala-OH**		FAA2070.0001	1 g	€ 750,00
N-alpha-(9-Fluorenylmethyloxycarbonyl)-alpha-propargyl-L-alanine, solvate with 20 to 50% MTBE (98%, 98%ee) CAS-NO: 1198791-65-9 FORMULA: $C_{21}H_{19}NO_4$ MOLECULAR WEIGHT: 349,38 g/mole		FAA2070.0005	5 g	€ 2750,00
FAA2080 **Fmoc-alpha-Prg-D-Ala-OH**		FAA2080.0001	1 g	€ 750,00
(S)-2-[(9-Fluorenylmethyloxycarbonyl)amino]-2-methyl-4-pentynoic acid, solvate with 20 to 50% MTBE (98%, 98%ee) CAS-NO: 1198791-58-0 FORMULA: $C_{21}H_{19}NO_4$ MOLECULAR WEIGHT: 349,38 g/mole		FAA2080.0005	5 g	€ 2750,00

Propargylcysteine

		Article No.	Quantity	Price
HAA2350 **H-L-Cys(Propargyl)-OH*HCl**		HAA2350.0001	1 g	€ 235,00
S-Propargyl-L-cysteine hydrochloride FORMULA: $C_6H_9NO_2S*HCl$ MOLECULAR WEIGHT: 159,21*36,45 g/mole		HAA2350.0005	5 g	€ 800,00

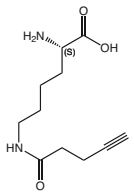
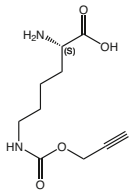
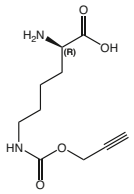
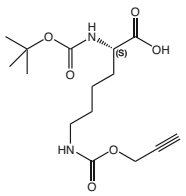
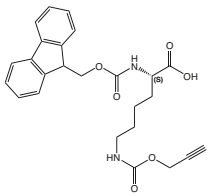
Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
BAA2250 Boc-L-Cys(Propargyl)-OH*DCHA N-alpha-t-Butyloxycarbonyl-S-propargyl-L-cysteine dicyclohexyl-amine FORMULA: $C_{11}H_{17}NO_4S*C_{12}H_{23}N$ MOLECULAR WEIGHT: 259,32*181,32 g/mole		BAA2250.0001	1 g	€ 145,00
		BAA2250.0005	5 g	€ 500,00
		BAA2250.0025	25 g	€ 2000,00
FAA3810 Fmoc-L-Cys(Propargyl)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-S-propargyl-L-cysteine FORMULA: $C_{21}H_{19}NO_4S$ MOLECULAR WEIGHT: 381,44 g/mole		FAA3810.0001	1 g	€ 145,00
		FAA3810.0005	5 g	€ 475,00
		FAA3810.0025	25 g	€ 1900,00

Applications using Boc-L-Cys(propargyl)-OH have been published in:

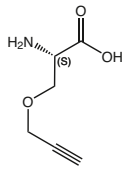
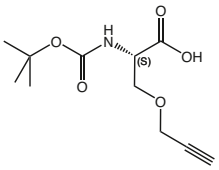
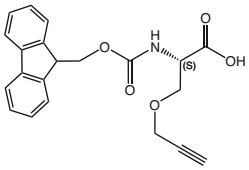
- Photoinduced Addition of Glycosyl Thiols to Alkynyl Peptides: Use of Free-Radical Thiol-Yne Coupling for Post-Translational Double-Glycosylation of Peptides; Mauro Lo Conte, Salvatore Pacifico, Angela Chambery, Alberto Marra and Alessandro Dondoni, *J. Org. Chem. 2010;* **75**: 4644.
- Neoglycopeptides through direct functionalization of cysteine; Christine Vala, Françoise Chrétien, Eva Balentova, Sandrine Lamandé-Langle and Yves Chapleur; *Tetrahedron Lett. 2011;* **52(1)**: 17-21

Propargyllysine

		Article No.	Quantity	Price
HAA2085 H-L-Lys(Pentynoyl)-OH (S)-2-Amino-6-(pent-4-ynamido)hexanoic acid FORMULA: $C_{11}H_{18}N_2O_3$ MOLECULAR WEIGHT: 226,27 g/mole		HAA2085.0001	1 g	€ 425,00
		HAA2085.0005	5 g	€ 775,00
		HAA2085.0025	25 g	€ 1475,00
HAA2090 H-L-Lys(Pryoc)-OH*HCl (S)-Amino-6-((prop-2-ynyloxy)carbonylamino)hexanoic acid hydrochloride FORMULA: $C_{10}H_{16}N_2O_4*HCl$ MOLECULAR WEIGHT: 228,25*36,45 g/mole		HAA2090.0001	1 g	€ 400,00
		HAA2090.0005	5 g	€ 600,00
		HAA2090.0025	25 g	€ 1000,00
HAA2095 H-D-Lys(Pryoc)-OH*HCl (R)-Amino-6-((prop-2-ynyloxy)carbonylamino)hexanoic acid hydrochloride FORMULA: $C_{10}H_{16}N_2O_4*HCl$ MOLECULAR WEIGHT: 228,25*36,45 g/mole		HAA2095.0500	500 mg	€ 275,00
		HAA2095.0001	1 g	€ 400,00
		HAA2095.0005	5 g	€ 600,00
		HAA2095.0025	25 g	€ 1100,00
BAA1960 Boc-L-Lys(Pryoc)-OH (S)-2-(t-Butyloxycarbonylamino)-6-((prop-2-ynyloxy)carbonylamino) hexanoic acid FORMULA: $C_{15}H_{24}N_2O_6$ MOLECULAR WEIGHT: 328,36 g/mole		BAA1960.0001	1 g	€ 425,00
		BAA1960.0005	5 g	€ 675,00
		BAA1960.0025	25 g	€ 1025,00
FAA3150 Fmoc-L-Lys(Pryoc)-OH (S)-2-((9-Fluorenylmethyloxyl)amino)-6-((prop-2-ynyloxy)carbonyl-amino)hexanoic acid FORMULA: $C_{25}H_{26}N_2O_6$ MOLECULAR WEIGHT: 450,48 g/mole		FAA3150.0001	1 g	€ 425,00
		FAA3150.0005	5 g	€ 750,00
		FAA3150.0025	25 g	€ 1200,00

Prices are in EUR, net, exw Germany

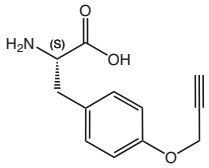
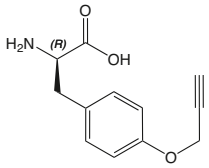
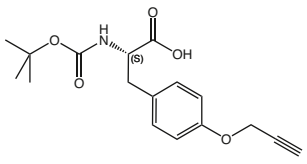
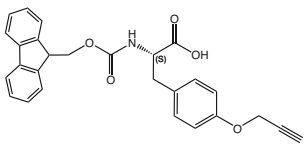
Propargylserine

		Article No.	Quantity	Price
HAA2355 H-L-Ser(Propargyl)-OH*HCl O-Propargyl-L-serine hydrochloride FORMULA: $C_6H_9NO_3$*HCl MOLECULAR WEIGHT: 143,14*36,45 g/mole		HAA2355.0001 HAA2355.0005	1 g 5 g	€ 200,00 € 700,00
BAA2260 Boc-L-Ser(Propargyl)-OH*DCHA N-alpha-t-Butyloxycarbonyl-O-propargyl-L-serine dicyclohexylamine FORMULA: $C_{11}H_{17}NO_5$*$C_{12}H_{23}N$ MOLECULAR WEIGHT: 243,26*181,32 g/mole		BAA2260.0001 BAA2260.0005 BAA2260.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2700,00
FAA3820 Fmoc-L-Ser(Propargyl)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-O-propargyl-L-serine FORMULA: $C_{21}H_{19}NO_5$ MOLECULAR WEIGHT: 365,38 g/mole		FAA3820.0001 FAA3820.0005 FAA3820.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2700,00

Applications using Boc-L-Ser(propargyl)-OH have been published in:

- Isoxazolyl-Serine-Based Agonists of Peroxisome Proliferator-Activated Receptor: Design, Synthesis, and Effects on Cardiomyocyte Differentiation; Zhi-Liang Wei *et al.; J. Am. Chem. Soc. 2004;* **126**: 16714.
- Lacosamide Isothiocyanate-based Agents: Novel Agents to Target and Identify Lacosamide Receptors; Ki Duk Park *et al.; J. Med. Chem. 2009;* **52**: 6897.

Propargyltyrosine

		Article No.	Quantity	Price
HAA1971 H-L-Tyr(Propargyl)-OH*HCl O-Propargyl-L-tyrosine hydrochloride CAS-NO: 610794-20-2 net FORMULA: $C_{12}H_{13}NO_3$*HCl MOLECULAR WEIGHT: 219,24*36,45 g/mole		HAA1971.0001 HAA1971.0005	1 g 5 g	€ 250,00 € 900,00
HAA2020 H-D-Tyr(Propargyl)-OH O-Propargyl-D-tyrosine CAS-NO: 1170674-20-0 FORMULA: $C_{12}H_{13}NO_3$ MOLECULAR WEIGHT: 219,24 g/mole		please inquire!		
BAA2265 Boc-L-Tyr(Propargyl)-OH*DCHA N-alpha-t-Butyloxycarbonyl-O-propargyl-L-tyrosine dicyclohexylamine FORMULA: $C_{17}H_{21}NO_5$ MOLECULAR WEIGHT: 319,35 g/mole		BAA2265.0001 BAA2265.0005 BAA2265.0025	1 g 5 g 25 g	€ 145,00 € 500,00 € 2000,00
FAA3830 Fmoc-L-Tyr(Propargyl)-OH N-alpha-(9-Fluorenylmethyloxycarbonyl)-O-propargyl-L-tyrosine FORMULA: $C_{27}H_{23}NO_5$ MOLECULAR WEIGHT: 441,48 g/mole		FAA3830.0001 FAA3830.0005 FAA3830.0025	1 g 5 g 25 g	€ 225,00 € 850,00 € 3400,00

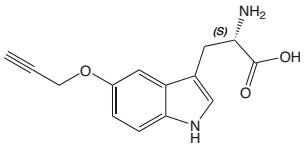
Prices are in EUR, net, exw Germany

Propargyltryptophane

Article No.	Quantity	Price

HAA2010 H-L-Trp(5-OPropargyl)-OH

5-Propargyloxy-L-tryptophane
FORMULA: $C_{14}H_{14}N_2O_3$
MOLECULAR WEIGHT: 258,27 g/mole

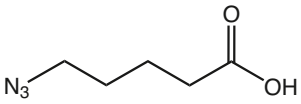


please inquire!

e) Azido & Alkyne Acids for Click Chemistry

AAA1970 N_3-Pen-OH

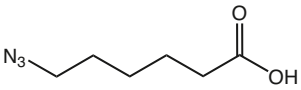
5-Azido-pentanoic acid
CAS-NO: 79583-98-5
FORMULA: $C_5H_9N_3O_2$
MOLECULAR WEIGHT: 143,14 g/mole



AAA1970.0001	1 g	€	120,00
AAA1970.0005	5 g	€	450,00

AAA1960 N_3-Hx-OH

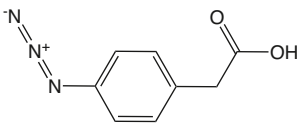
6-Azido-hexanoic acid
CAS-NO: 79598-53-1
FORMULA: $C_6H_{11}N_3O_2$
MOLECULAR WEIGHT: 157,17 g/mole



AAA1960.0001	1 g	€	120,00
AAA1960.0005	5 g	€	450,00

HAA2245 N_3-PhAc-OH

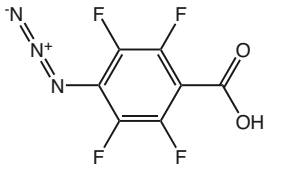
(4-Azidophenyl)acetic acid
CAS-NO: 62893-37-2
FORMULA: $C_8H_7N_3O_2$
MOLECULAR WEIGHT: 177,16 g/mole



HAA2245.0001	1 g	€	125,00
HAA2245.0005	5 g	€	450,00
HAA2245.0025	25 g	€	1800,00

RL-2035 N_3-TFBA

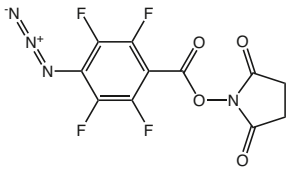
4-Azido-2,3,5,6-tetrafluorobenzoic acid
CAS-NO: 122590-77-6
FORMULA: $C_7HF_4N_3O_2$
MOLECULAR WEIGHT: 235,1 g/mole



RL-2035.0001	1 g	€	250,00
RL-2035.0005	5 g	€	1000,00

RL-2045 N_3-TFBA-NHS

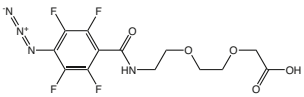
N-Succinimidyl 4-azido-2,3,5,6-tetrafluorobenzoate
CAS-NO: 126695-58-7
FORMULA: $C_{11}H_4F_4N_4O_4$
MOLECULAR WEIGHT: 332,17 g/mole



RL-2045.0500	500 mg	€	250,00
RL-2045.1000	1 g	€	400,00
RL-2045.5000	5 g	€	1600,00

PEG5000 N_3-TFBA-O2Oc

{2-[2-(4-Azido-2,3,5,6-tetrafluorobenzoyl-amino)ethoxy]ethoxy}acetic acid
FORMULA: $C_{13}H_{12}F_4O_5$
MOLECULAR WEIGHT: 380,25 g/mole



PEG5000.0250	250 mg	€	225,00
PEG5000.1000	1 g	€	500,00
PEG5000.5000	5 g	€	2000,00

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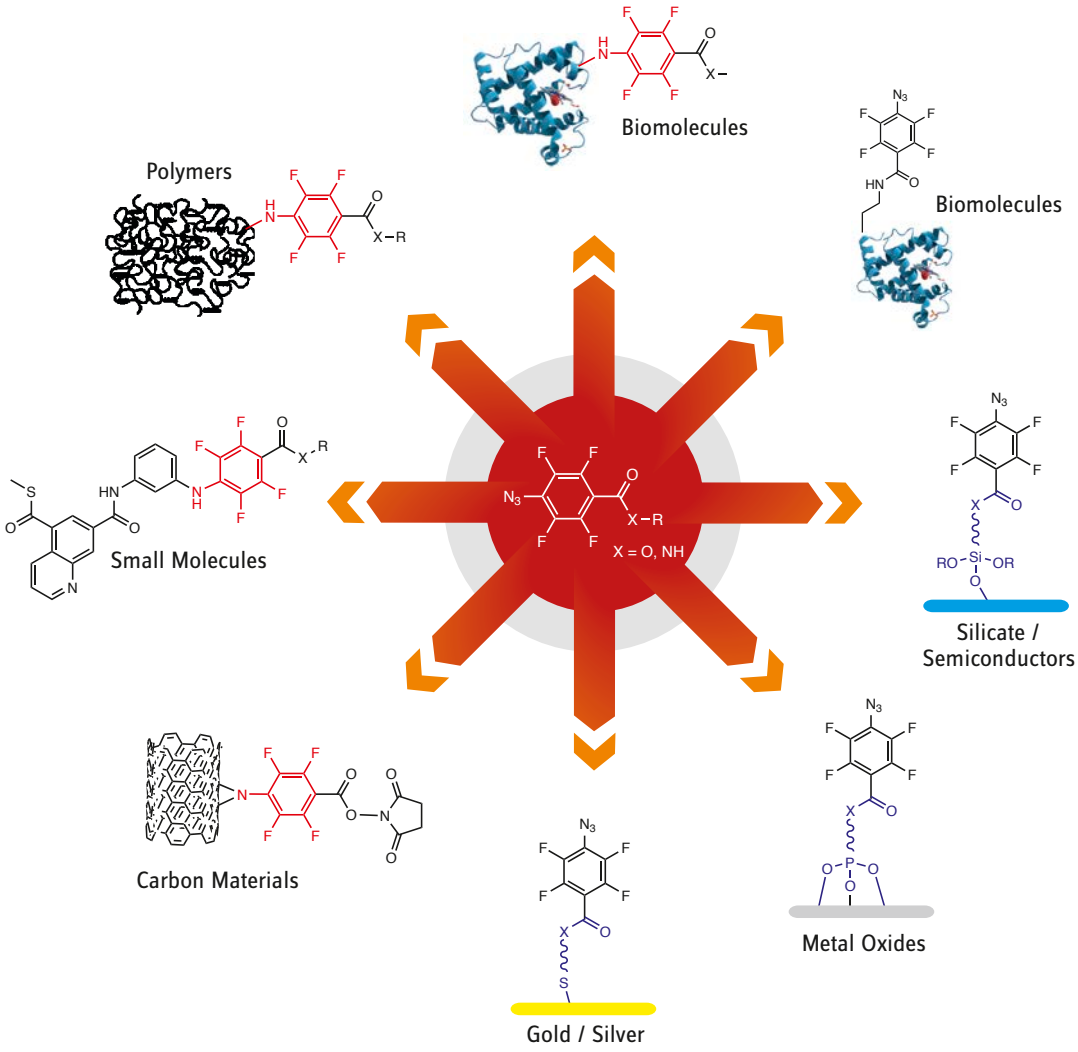
New Photo Cross-Linker

New Photolabeling and Cross-Linking Methods with Perfluorophenyl Azides



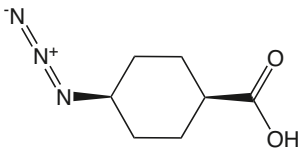
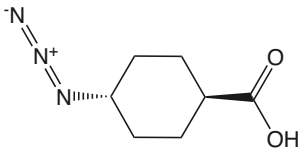
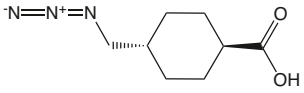
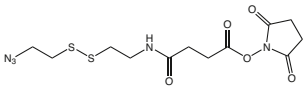
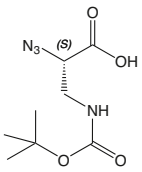
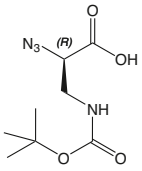
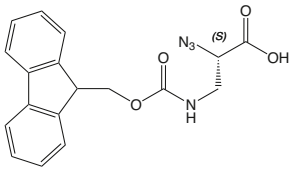
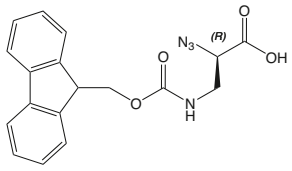
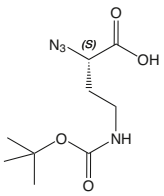
Aryl azides are well-known precursors of nitrenes and have been introduced by Fleet *et al.* as versatile photoaffinity labeling agents to probe biological receptors. Upon photolysis, N_2 is liberated and a highly unstable singlet Phenylnitrene is being formed in situ, which reacts with neighboring molecules in a variety of reactions. Perfluorophenyl azides, however, form highly stabilized nitrene intermediates that undergo insertion and addition reactions in moderate to good yields rather than intermolecular rearrangements. This type of compounds has been used as photo cross-linker (Lambda max = 258nm) in estrogen receptor studies and for direct surface coating of carbon and organic based polymers.

The field of applications is rather wide, as these compounds can be used for conventional click chemistry applications and also as photo activated linkers for conjugation of small compounds and large biomolecules, as well as for surface functionalization and nanomaterial synthesis.

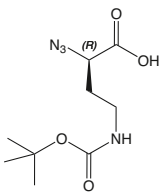
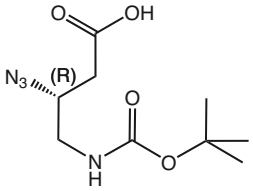
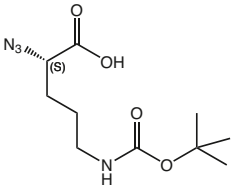
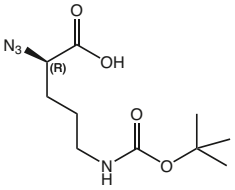
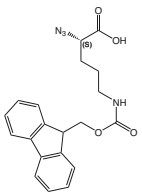
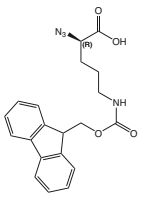
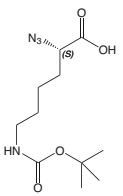
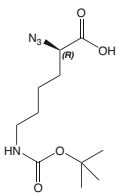
References:

- Affinity of Antibodies with Aryl Nitrenes as Reactive Group; G.W.J. Fleet, R.R. Porter, J.R. Knowles; *Nature* 1969; **224:** 511-512.
- Perfluorophenyl Azides: New Applications in Surface Functionalization and Nanomaterial Synthesis; Li-Hong Liu, Mingdi Yan; *Accounts of Chemical Research* 2011; **43(11):** 1434-1443. DOI 10.1021/ar100066t.

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
HAA2230 N_3-1,4-cis-CHC-OH cis-4-Azidocyclohexanecarboxylic acid CAS-NO: 863222-21-3 FORMULA: $C_7H_{11}N_3O$ MOLECULAR WEIGHT: 169,18 g/mole		HAA2230.0001 HAA2230.0005 HAA2230.0025	1 g 5 g 25 g	€ 125,00 € 450,00 € 1800,00
HAA2235 N_3-1,4-trans-CHC-OH trans-4-Azidocyclohexanecarboxylic acid FORMULA: $C_7H_{11}N_3O_2$ MOLECULAR WEIGHT: 169,18 g/mole		HAA2235.0001 HAA2235.0005 HAA2235.0025	1 g 5 g 25 g	€ 125,00 € 450,00 € 1800,00
HAA2240 N_3-trans-MCHC-OH trans-4-(Azidomethyl)cyclohexanecarboxylic acid FORMULA: $C_8H_{13}N_3O_2$ MOLECULAR WEIGHT: 183,21 g/mole		HAA2240.0001 HAA2240.0005 HAA2240.0025	1 g 5 g 25 g	€ 110,00 € 375,00 € 1500,00
HAA2255 N_3-Cystamine-Suc-OSu 4-(2-((2-Azidoethyl)disulfanyl)ethylamino)-4-oxobutanoic acid succinimidyl ester FORMULA: $C_{12}H_{17}N_5O_5S_2$ MOLECULAR WEIGHT: 375,42 g/mole		HAA2255.0100 HAA2255.0250 HAA2255.0500 HAA2255.1000	100 mg 250 mg 500 mg 1 g	€ 200,00 € 400,00 € 750,00 € 1200,00
HAA2130 N_3-L-Dap(Boc)-OH (S)-2-Azido-3-((t-butyloxycarbonyl)amino)propanoic acid FORMULA: $C_8H_{14}N_4O_4$ MOLECULAR WEIGHT: 230,22 g/mole		HAA2130.0001 HAA2130.0005 HAA2130.0025	1 g 5 g 25 g	€ 175,00 € 600,00 € 2400,00
HAA2135 N_3-D-Dap(Boc)-OH (R)-2-Azido-3-((t-butyloxycarbonyl)amino)propanoic acid FORMULA: $C_8H_{14}N_4O_4$ MOLECULAR WEIGHT: 230,22 g/mole		HAA2135.0001 HAA2135.0005 HAA2135.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2800,00
HAA2140 N_3-L-Dap(Fmoc)-OH (S)-2-Azido-3-[(9-fluorenylmethyloxycarbonyl)amino]propanoic acid CAS-NO: 880637-82-1 FORMULA: $C_{18}H_{16}N_4O_4$ MOLECULAR WEIGHT: 352,34 g/mole		HAA2140.0001 HAA2140.0005 HAA2140.0025	1 g 5 g 25 g	€ 200,00 € 700,00 € 2800,00
HAA2145 N_3-D-Dap(Fmoc)-OH (R)-2-Azido-3-[(9-fluorenylmethyloxycarbonyl)amino]propanoic acid FORMULA: $C_{18}H_{16}N_4O_4$ MOLECULAR WEIGHT: 352,34 g/mole		HAA2145.0001 HAA2145.0005 HAA2145.0025	1 g 5 g 25 g	€ 225,00 € 850,00 € 3400,00
HAA2150 N_3-L-Dab(Boc)-OH (S)-2-Azido-4-((t-butyloxycarbonyl)amino)butanoic acid FORMULA: $C_9H_{16}N_4O_4$ MOLECULAR WEIGHT: 244,25 g/mole		HAA2150.0001 HAA2150.0005 HAA2150.0025	1 g 5 g 25 g	€ 150,00 € 500,00 € 2000,00

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
HAA2155 N_3-D-Dab(Boc)-OH (R)-2-Azido-4-((t-butyloxycarbonyl)amino)butanoic acid FORMULA: $C_9H_{16}N_4O_4$ MOLECULAR WEIGHT: 244,25 g/mole		HAA2155.0001 HAA2155.0005 HAA2155.0025	1 g 5 g 25 g	€ 225,00 € 800,00 € 3000,00
HAA2280 N_3-L-Dbu(Boc)-OH (R)-3-Azido-4-((t-butyloxycarbonyl)amino)butanoic acid FORMULA: $C_9H_{16}N_4O_4$ MOLECULAR WEIGHT: 244,25 g/mole		HAA2280.0250 HAA2280.1000 HAA2280.5000	250 mg 1 g 5 g	€ 175,00 € 450,00 € 1800,00
HAA2220 N_3-L-Orn(Boc)-OH*CHA (S)-2-Azido-5-[(t-butyloxycarbonyl)amino]pentanoic acid cyclo-hexylamine FORMULA: $C_{10}H_{18}N_4O_4*C_6H_{13}N$ MOLECULAR WEIGHT: 258,27*99,18 g/mole		HAA2220.0001 HAA2220.0005 HAA2220.0025	1 g 5 g 25 g	€ 150,00 € 450,00 € 1800,00
HAA2210 N_3-D-Orn(Boc)-OH*CHA (R)-2-Azido-5-[(t-butyloxycarbonyl)amino]pentanoic acid cyclo-hexylamine FORMULA: $C_{10}H_{18}N_4O_4*C_6H_{13}N$ MOLECULAR WEIGHT: 258,27*99,18 g/mole		HAA2210.0001 HAA2210.0005 HAA2210.0025	1 g 5 g 25 g	€ 200,00 € 650,00 € 2600,00
HAA2225 N_3-L-Orn(Fmoc)-OH (S)-2-Azido-5-[(9-fluorenylmethyloxycarbonyl)amino]pentanoic acid FORMULA: $C_{20}H_{20}N_4O_4$ MOLECULAR WEIGHT: 380,4 g/mole		HAA2225.0001 HAA2225.0005 HAA2225.0025	1 g 5 g 25 g	€ 185,00 € 550,00 € 2200,00
HAA2215 N_3-D-Orn(Fmoc)-OH (R)-2-Azido-5-[(9-fluorenylmethyloxycarbonyl)amino]pentanoic acid FORMULA: $C_{20}H_{20}N_4O_4$ MOLECULAR WEIGHT: 380,4 g/mole		HAA2215.0001 HAA2215.0005 HAA2215.0025	1 g 5 g 25 g	€ 210,00 € 700,00 € 2800,00
HAA2170 N_3-L-Lys(Boc)-OH (S)-2-Azido-6-[(t-butyloxycarbonyl)amino]hexanoic acid CAS-NO: 333366-32-8 FORMULA: $C_{11}H_{20}N_4O_4$ MOLECULAR WEIGHT: 272,3 g/mole		HAA2170.0001 HAA2170.0005 HAA2170.0025	1 g 5 g 25 g	€ 145,00 € 450,00 € 1800,00
HAA2175 N_3-D-Lys(Boc)-OH (R)-2-Azido-6-[(t-butyloxycarbonyl)amino]hexanoic acid CAS-NO: 1178899-92-7 FORMULA: $C_{11}H_{20}N_4O_4$ MOLECULAR WEIGHT: 272,3 g/mole		HAA2175.0001 HAA2175.0005 HAA2175.0025	1 g 5 g 25 g	€ 190,00 € 650,00 € 1900,00

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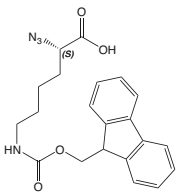
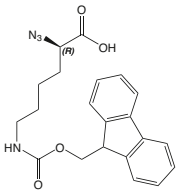
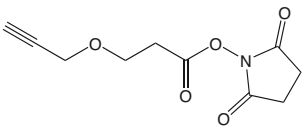
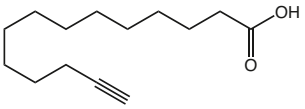
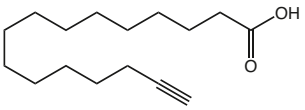
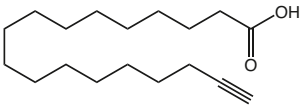
		Article No.	Quantity	Price
HAA2160	**N_3-L-Lys(Fmoc)-OH**	HAA2160.0001	1 g	€ 150,00
(S)-2-Azido-6-[(9-fluorenylmethyloxycarbonyl)amino]hexanoic acid		HAA2160.0005	5 g	€ 500,00
CAS-NO: 473430-12-5		HAA2160.0025	25 g	€ 2000,00
FORMULA: $C_{21}H_{22}N_4O_4$				
MOLECULAR WEIGHT: 394,42 g/mole				
HAA2165	**N_3-D-Lys(Fmoc)-OH**	HAA2165.0001	1 g	€ 200,00
(R)-2-Azido-3-[(9-fluorenylmethyloxycarbonyl)amino]propanoic acid		HAA2165.0005	5 g	€ 700,00
FORMULA: $C_{21}H_{22}N_4O_4$		HAA2165.0025	25 g	€ 2800,00
MOLECULAR WEIGHT: 394,42 g/mole				
PEG1935	**Propargyl-NHS**	PEG1935.0001	1 g	€ 490,00
3-(Prop-2-ynyloxy)propanoic acid succinimidyl ester		PEG1935.0100	100 mg	€ 150,00
CAS-NO: 1174157-65-3				
FORMULA: $C_{10}H_{11}NO_5$				
MOLECULAR WEIGHT: 225,2 g/mole				
RL-2055	**Alkyne-myristic acid**	RL-2055.0100	100 mg	€ 250,00
13-Tetradecynoic acid		RL-2055.0500	500 mg	€ 950,00
CAS-NO: 82909-47-5		RL-2055.1000	1 g	€ 1750,00
FORMULA: $C_{14}H_{24}O_2$				
MOLECULAR WEIGHT: 224.34 g/mole				
RL-2060	**Alkyne-palmitic acid**	RL-2060.0100	100 mg	€ 300,00
15-Hexadecynoic acid		RL-2060.0500	500 mg	€ 1200,00
CAS-NO: 99208-90-9		RL-2060.1000	1 g	€ 2100,00
FORMULA: $C_{16}H_{28}O_2$				
MOLECULAR WEIGHT: 252.39 g/mole				
RL-2065	**Alkyne-stearic acid**	RL-2065.0100	100 mg	€ 275,00
17-Octadecynoic acid		RL-2065.0500	500 mg	€ 1100,00
CAS-NO: 34450-18-5		RL-2065.1000	1 g	€ 2000,00
FORMULA: $C_{18}H_{32}O_2$				
MOLECULAR WEIGHT: 280.45 g/mole				

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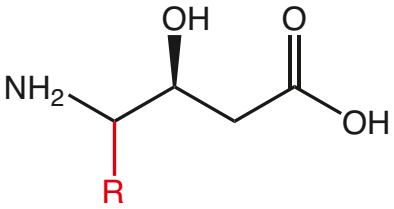

R: Ala, Arg(Pbf), Asn(Trt) ..... Trp(Boc), Tyr(tBu), Val

Custom synthesis of statine analogues from Alanine through Valine and any other non-natural residue.

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3. Spermines and Amines for Click Chemistry

Spermines and other Biogenic Polyamines Interact with DNA!

Polyamines stabilise nucleic acids against chemical and enzymatic degradation, facilitate the formation of secondary and tertiary structures and enhance cellular uptake.

- Andrew J. Marsh, David M. Williams and Jane A. Grasby; *Organic & Biomolecular Chemistry* 2004; **2:** 2103 – 2112.

Spermine participates in oxidative damage of guanosine and 8-oxoguanosine leading to deoxyribosylurea formation.

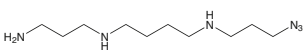
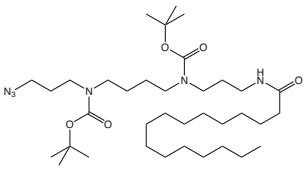
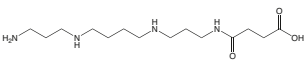
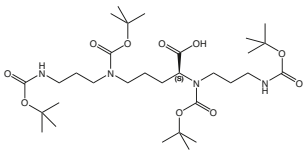
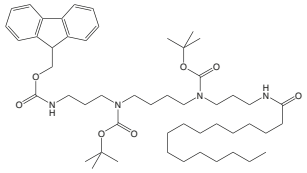
- M.E. Hosford, J.G. Muller, C.J. Burrows; *J. Am. Chem. Soc.* 2004; **126:** 9540-9541.

Small molecules bind to DNA quadruplexes $[d(G3T4G3)]_2$ and spermine has a stronger affinity for folded DNA quadruplexes over duplex DNA and linear quadruplexes.

- M. A. Keniry; Quadruplex structures in nucleic acids. *Biopolymers* 2001; **56:** 123-146.

Structural analysis of DNA interactions with biogenic polyamines and Cobalt(III)hexamine studied by fourier transform infrared and capillary electrophoresis; biogenic polyamines, such as putrescine and spermidine are involved in numerous diverse biological processes. Due to their binding to DNA and RNA they play an important role in nucleic acid function and cause DNA condensation and aggregation inducing DNA conformational changes.

- Amin Ahmed Ouameur and Heidar-Ali Tajmir-Riahi; *J. Biol. Chem.* 2004; **279(40):** 42041-42054.

		Article No.	Quantity	Price
SNN1170 Spermine(HHHN$_3$)*3HCl N_1-(3-Aminopropyl)-N_4-(3-azidopropyl)butane-1,4-diamine trihydrochloride CAS-NO: 1190203-77-0net FORMULA: $C_{10}H_{24}N_6$*3HCl MOLECULAR WEIGHT: 228,34*109,38 g/mole		SNN1170.0250 SNN1170.1000 SNN1170.5000	250 mg 1 g 5 g	€ 245,00 € 800,00 € 3200,00
SNN1180 Spermine(N$_3$BBPalm) N_1-Azido-N_2,N_3-bis-(t-butyloxycarbonyl)-N_4-palmitoyl-1,5,10,14-tetra-aza-quatrodecan FORMULA: $C_{36}H_{70}N_6O_5$ MOLECULAR WEIGHT: 666,98 g/mole		SNN1180.0100 SNN1180.0500 SNN1180.1000	100 mg 500 mg 1 g	€ 500,00 € 1200,00 € 3250,00
SNN1150 Spermine(HHHSuc-OH) 1,5,10,14-Tetra-aza-quatrodecan-N_4-succinamic acid FORMULA: $C_{14}H_{30}N_4O_3$ MOLECULAR WEIGHT: 302,42 g/mole		SNN1150.0500 SNN1150.0001	500 mg 1 g	€ 750,00 € 1200,00
SNN1190 Spermine(BBBB-CO2H) (S) (S)-N_1,N_5,N_{10},N_{14}-Tetrakis-(t-butyloxycarbonyl)-1,5,10,14-tetraazatetradecan-9-carboxylic acid CAS-NO: 119798-08-2 FORMULA: $C_{31}H_{58}N_4O_{10}$ MOLECULAR WEIGHT: 646,81 g/mole		SNN1190.0001 SNN1190.0005	1 g 5 g	€ 300,00 € 1200,00
SNN1100 Spermine(FBBPalm) N_2,N_3-Bis-(t-butyloxycarbonyl)-N_1-(9-fluorenylmethyloxycarbonyl)-N_4-palmitoyl-1,5,10,14-tetra-aza-quatrodecan FORMULA: $C_{51}H_{82}N_4O_7$ MOLECULAR WEIGHT: 863,24 g/mole		SNN1100.0500 SNN1100.0001	500 mg 1 g	€ 750,00 € 1200,00

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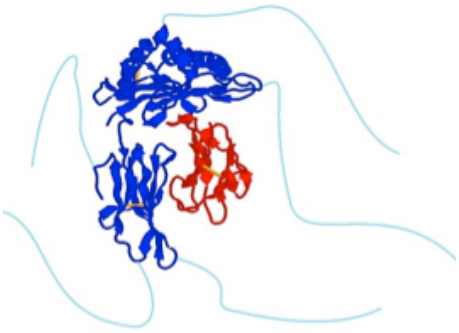
4. Click Reagents for Drug Delivery

a) Principles of Polymer Therapeutics

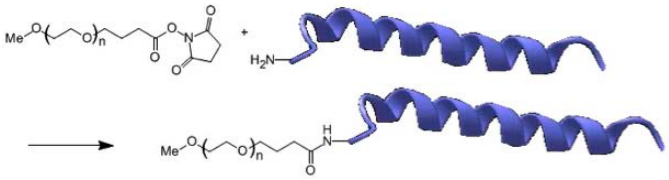
Proteins and other Biopharmaceuticals have a high potential as drugs due to their specificity and efficacy, but show poor pharmacokinetic properties. Attaching polymers which are tolerated by the physiologic system, such as **PGA** (poly(glutamic acid)), **PEG** (poly(ethylene glycol)) or **PAS** (random polypeptide of proline, alanine and serine) improves drastically their bioavailability and biodistribution and turns sensitive biomolecules into robust drugs.



PEGylated Enzyme

In 2016 the market of modern biopharmaceuticals is expected to reach a volume of $200 billion per year world wide (IMS Health, Inc.). The big advantage of proteins, antibodies, siRNA, and other natural products in their usage as drugs is their high specificity in combination with their low side effects. Normally they interact with the dedicated target only and thus do not show unwanted activities and side effects at any other place in the body. A current focus is the study of modern drug carrier systems where biotolerable linkers are connecting a recognition part with a drug-active part. Conjugations can reach the size of a nanoparticle. The recognition part can be a peptide or hormone which binds specifically to the surface of a certain cell. After internalization of the whole nanoparticle the active part (DNA or siRNA, for example) is released. Inhibition or activation of certain enzymes or the nucleus follows with the consequence to repair the sick cell, to shut it down by initiating apoptosis or other mechanisms. Is the recognition part somehow specific to a certain individual, the drug system becomes personalized (“**Personalized Medicine**”). In conjugation with hydrophobic compounds forming amphiphilic and biodegradable block-copolymers like PEG-PLA (polylactic acid) and PEG-PLGA (co-polylactic acid-glycolic acid) sophisticated micelles are formed, where drug molecules can be masked and protected against attacks by the immune system.

Modern biopharmaceuticals are ideal drugs. However, their significant drawback is their low stability under physiological conditions. Due to the fact that they are similar to biological components, they are also easily attacked by the immune system of the body, i.e. by antibodies and proteolytic degradation enzymes. Many efforts have been made by highly sophisticated formulation techniques, special application methods (depots) and chemical modifications to improve their pharmacokinetic properties. One approach, which shows much better results than other methods tried in the past, is Polymer Therapeutics, i.e. attaching polymers to the active component. One possibility is attaching a monofunctional PEG chain to a protein, antibody or small drug molecule. Using bifunctional PEGs, a linkage between two compounds can be formed in order to build dimers or more complex conjugates.



PEGylated Peptide

There has been a permanent search for new types of polymers going on, in order to enlarge the field of *Polymer Therapeutics* to new classes of drug molecules. One interesting group are poly amino acids consisting of one amino acid as monomer. Typical examples are polylysine and poly(glutamic acid) - polymers, that don't exist in nature, but show good physiological properties due to their similarity to natural proteins. **PGA - poly(glutamic acid)** has been identified as suitable carrier system. PGA shows the ability to conjugate with partners on N- and C-terminus, analogue to alpha and omega derivatisation of a PEG – poly(ethylene glycol). Additionally – and in fact the way mostly used so far – the glutamic acid side chains are used for forming any carbonyl function, like esters and amides. The number of side chains is very high compared to only one N- and C-terminus in one chain. Therefore a multiple loading to the polymer chain is possible. Therefore, with PGA the polymer therapeutics effect can also be applied to small drug molecules. It is theoretically also possible to PEGylate a small molecule. However, inactivation of the small drug molecule is often the consequence. **PGA therefore is an ideal carrier in particular for APIs with low molecular weight.**

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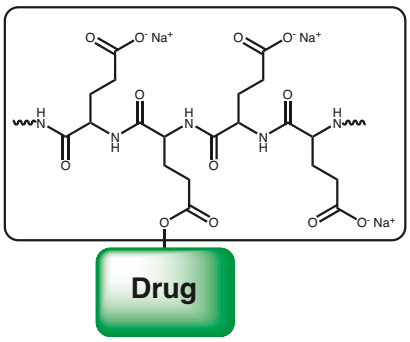
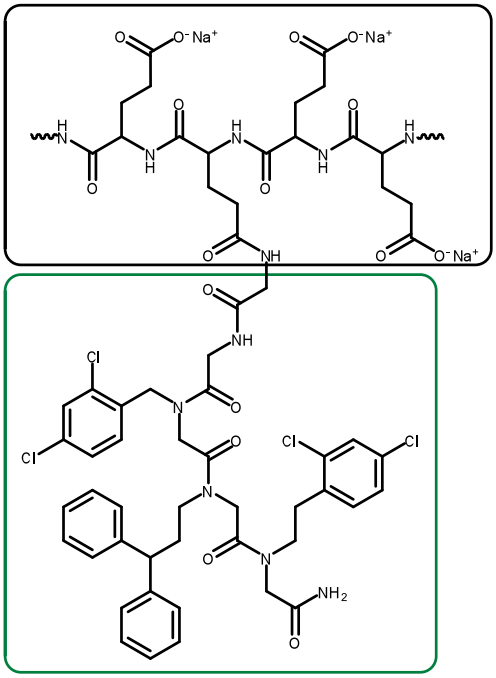
PGA



PGA



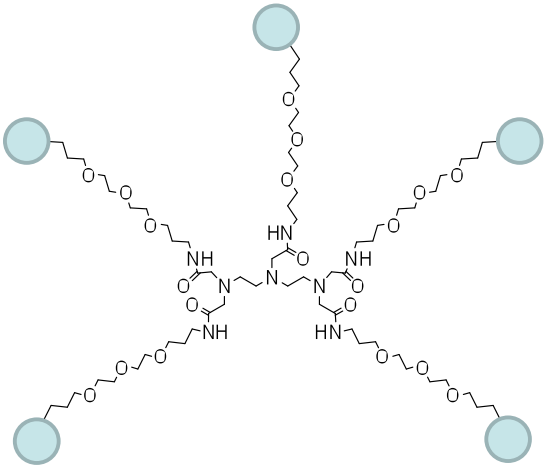
PGA Peptide Conjugate

References:

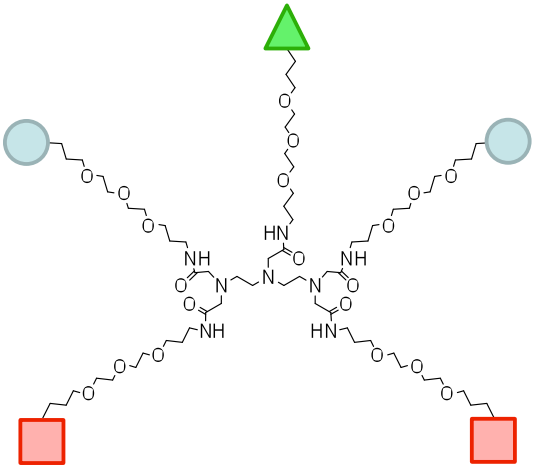
- Modulation of Cellular Apoptosis with Apoptotic Protease-Activation Factor 1 (Apaf-1) Inhibitors; L. Mondragón, M. Orzáez, G. Sanclimens, A. Moure, A. Armiñán, P. Sepúlveda, A. Messeguer, M. J. Vicent, E. Pérez-Payá; *J. Med. Chem.* 2008; **51:** 521-529.
- Integrin-assited drug delivery of nano-scaled polymer therapeutics bearing paclitaxel; Anat Eldar-Boock, Keren Miller, Joaquin Sanchis, Ruth Lupu, Maria J. Vicent, Ronit Satchi-Fainaro; *Biomaterials* 2011; **32**: 3862-3874.

PGA, **PEG** and **PAS** are polymers lining up each of their monomers in one row. Since long there have been made efforts to design large molecules with building blocks of higher valency (trivalent and higher), in order to build up a three-dimensional highly branched construct. Polylysine, as a typical example, has already been used for immunogenic applications since decades. These so called dendrimers and dendrons are monodisperse and usually highly symmetric, spherical compounds. Their properties are dominated by the functional groups on their outer shell. Dendrimers are classified by generation, which refers to the number of repeated branching cycles that are performed during their synthesis.

Applications of dendrimers typically involve conjugating other chemical species to the dendrimer surface that can function as detecting agents (such as a dye molecule) in diagnostic applications, affinity ligands, targeting components, radioligands, imaging agents, or pharmaceutically active compounds. Dendrimers have very strong potential, because their structure leads to multivalent systems. In other words, one dendrimer molecule has many of possible sites to couple to an active species. The majority of drugs available in pharmaceutical industry are hydrophobic in nature and this property in particular creates major formulation problems. This drawback of drugs can be overcome by hydrophilic dendrimeric scaffolding.



First generation pentavalent PEG based dendrimer with five identical reactive groups.



First generation pentavalent PEG based dendrimer with three different reactive groups, for example Click reactive, carboxylic acid (amine reactive) and protected amine (nucleophilic).

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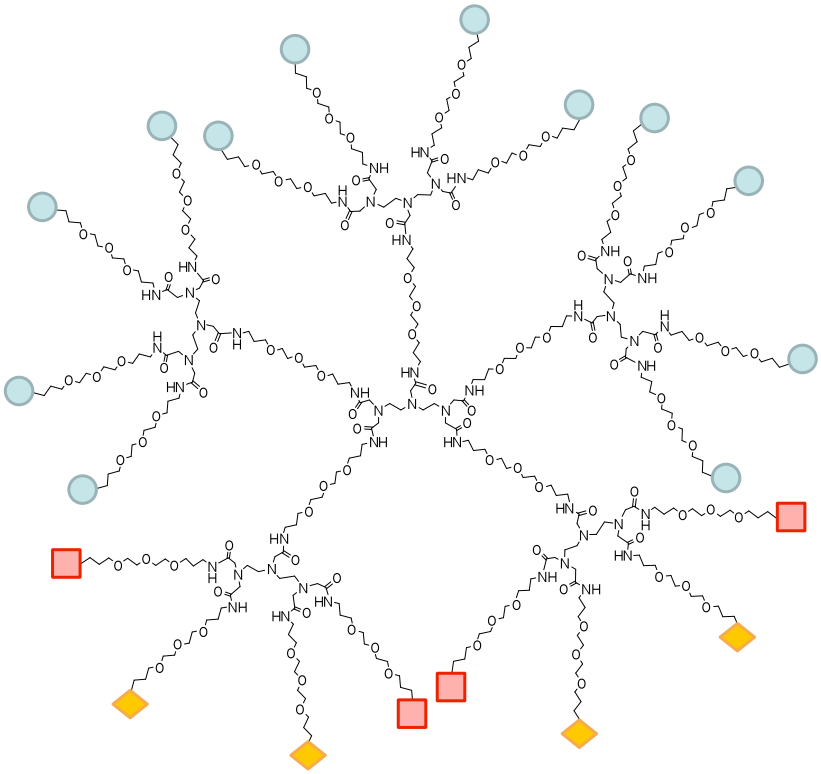

Second generation dendrimer based on a pentavalent PEG based building block for sophisticated applications in drug delivery, diagnostics, combination therapy or personalized medicine.

Examples in drug delivery applications combine dye molecules and a strand of DNA on the same dendrimer. Approaches for delivering unaltered natural products using polymeric carriers are of widespread interest. Dendrimers have been explored for the encapsulation of hydrophobic compounds and for the delivery of anticancer drugs. The physical characteristics of dendrimers, including their monodispersity, water solubility, encapsulation ability, and large number of functionalizable peripheral groups, make these macromolecules appropriate candidates for evaluation as drug delivery vehicles. Dendrimers have been explored for controlled delivery of antiretroviral bioactives. The inherent antiretroviral activity of dendrimers enhances their efficacy as carriers for antiretroviral drugs. These encouraging results of current examples provide further impetus to design, synthesize, and evaluate new dendritic polymers for use in basic drug delivery studies and eventually in the clinic.

References:

- Targeting Potential and Anti HIV activity of mannosylated fifth generation poly (propyleneimine) Dendrimers; Tathagata Dutta and N.K. Jain; *Biochimica et Biophysica Acta* 2007; **1770**: 681-686.
- Targeting of Efavirenz Loaded Tuftsin Conjugated Poly(propyleneimine) dendrimers to HIV infected macrophages in vitro; Tathagata Dutta, Minakshi Garg, Narendra K. Jain; *Eur. J. Pharm. Sci.* 2008; **34(2-3)**: 181-189.
- Poly (propyleneimine) dendrimer based nanocontainers for targeting of efavirenz to human monocytes/macrophages in vitro; Tathagata Dutta, Hrushikesh B. Agashe, Minakshi Garg, Prahlad Balakrishnan, Madhulika Kabra, Narendra K. Jain; *Journal of Drug Targeting.* 2007; **15(1)**: 84-96.
- External Electrostatic Interaction versus Internal Encapsulation between Cationic Dendrimers and Negatively Charged Drugs: Which Contributes More to Solubility Enhancement of the Drugs? Cheng, Yiyun; Qinglin Wu, Yiwen Li, Tongwen Xu; *Journal of Physical Chemistry B* 2008; **112(30)**: 8884-8890. doi:10.1021/jp801742t. PMID 18605754.

Find more detailed information on Polymer Therapeutics and many more compounds from this field in our brochure "Comprehensive Drug Delivery Survey":

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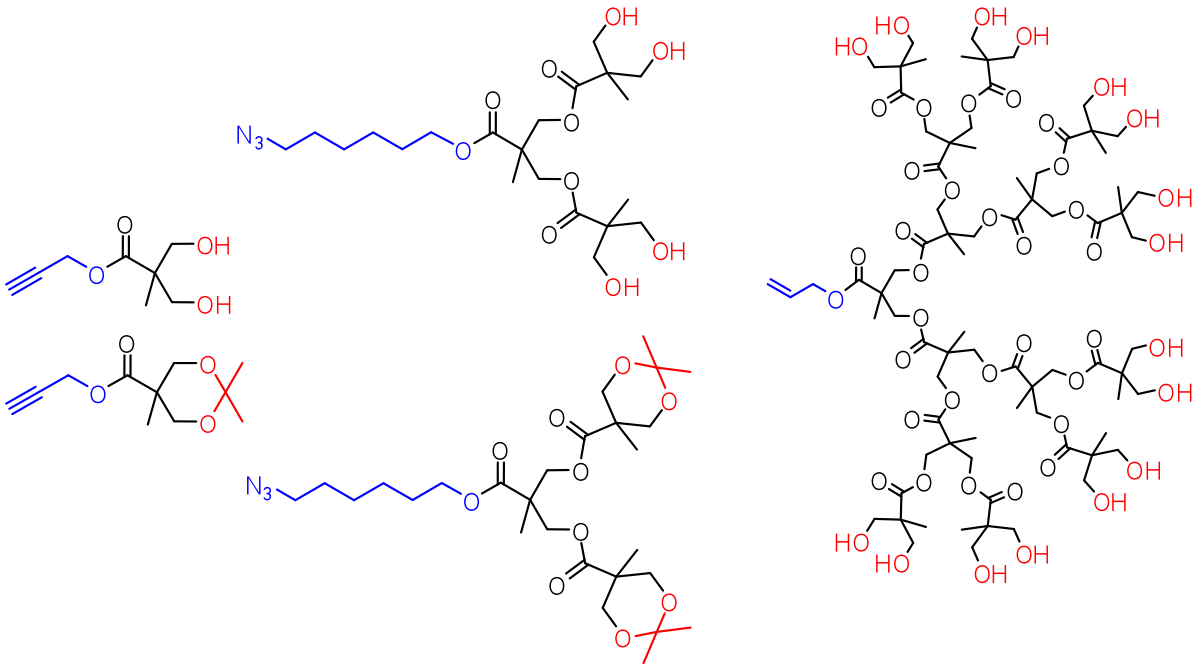
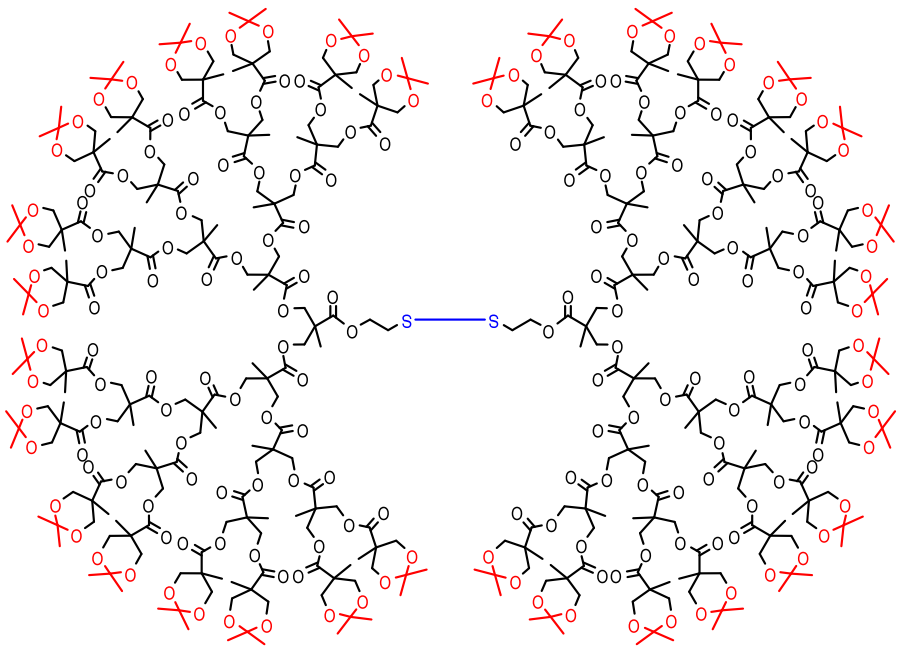
Applications with Dendrons

Dendrimers offer a new possibility to derivatize small molecules, surfaces or biopharmaceuticals with a monodisperse macromolecule and alter in this way properties like solubility and hydrophilicity. Immunogenicity and pharmacokinetics of pharmaceuticals will be improved.

The synthetic approach for designing these dendrons of different generations is based on 2,2-bis(hydroxymethyl) propionic acid, which is a non-toxic and biocompatible building block.





$C_{410}H_{634}O_{188}S_2$, MW = 8635,4 g/mole

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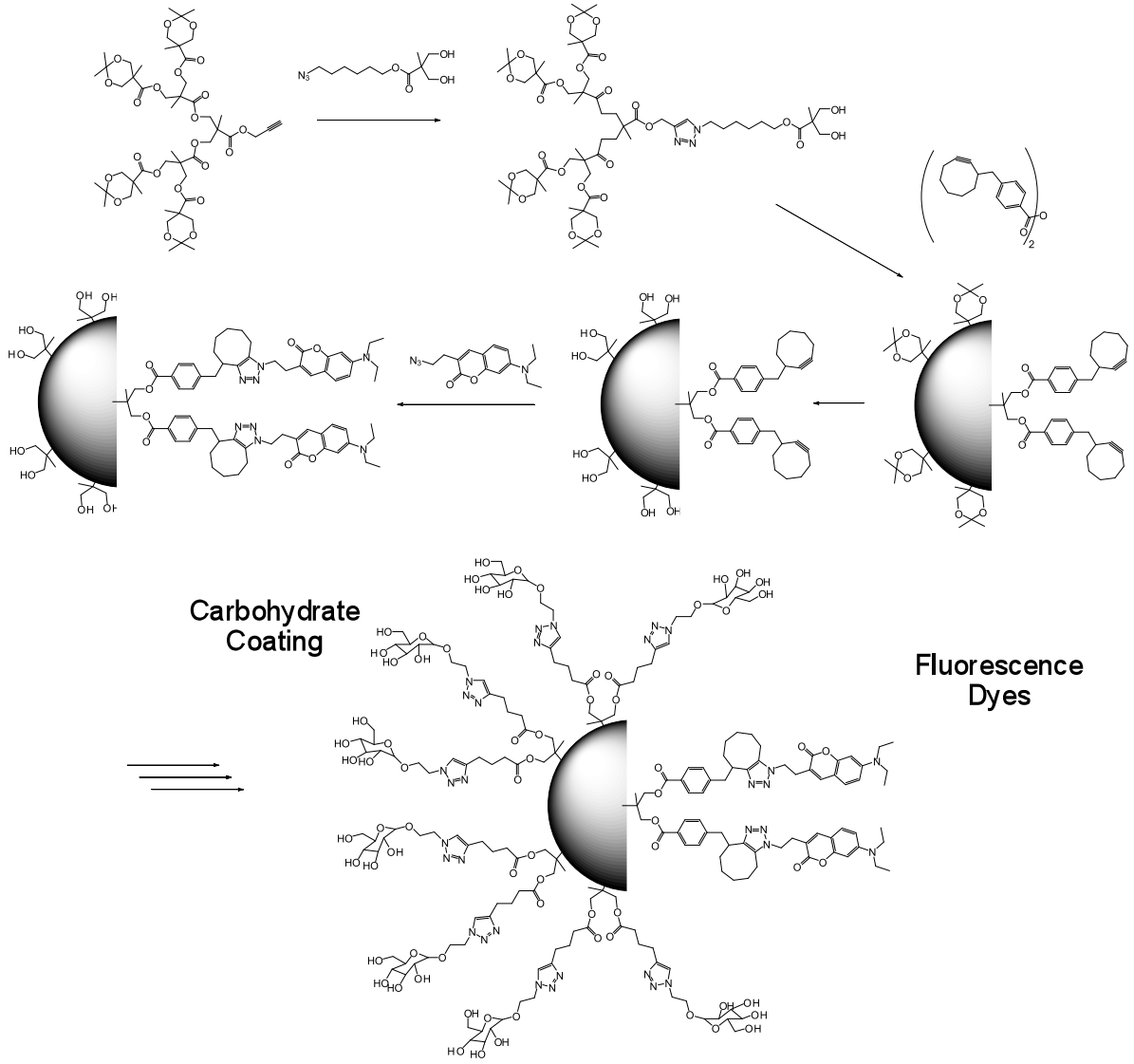
The size can be designed from 250 g/mole for 1st generation dendrons to over 4400 g/mole with 5th generation compounds. Dendrimers can be designed reaching even a molecular weight of some 10.000 Da. As focal point alkyne and azido functions are used with appropriate counterparts in any type of click chemistry reaction.

Olefinic functions offer the possibility for addition reaction or conjugation by metathesis reactions or photo reactions with the aid of UV light. For the modification of gold surfaces sulphur bearing dendrons can be used. They also conjugate with biologicals via disulfide bridge formation.



Hydroxyl and acetonide functions are available as terminal groups. Thus the surface can be designed as either hydrophilic or hydrophobic. In particular the hydrophobic acetonide variations offer through their amphiphilic nature interesting properties, as the centre is still polar and hydrophilic. This improves solubility in biological liquids. The hydrophobic surface helps to interact with lipids, cell surfaces, and hydrophobic enzymes like lipases. Furthermore, the acetonides offer another advantages for chemical diversity. They can be removed and thus be a temporary protecting group for further derivatization of the dendritic surface.

Literature:

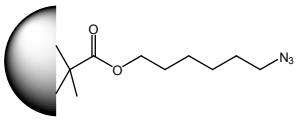
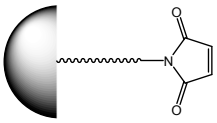
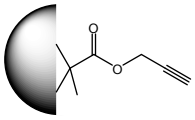
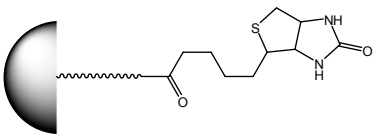
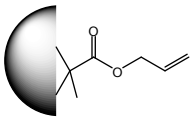
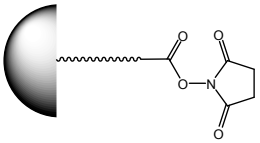
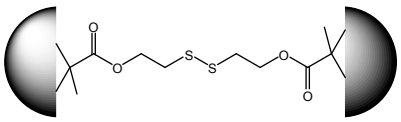
- Multivalent, bifunctional dendrimers prepared by click chemistry; P. Wu, M. Malkoch, J.N. Hunt *et al.*; *Chem. Commun.* 2005; **46**: 5775-5777. DOI: 10.1039/b512021g
- Europium confined cyclen dendrimers with photophysically active triazoles; P. Antoni, M. Malkoch, G. Vamvounis *et al.*; *J. Mater. Chem.* 2008; **18(22)**: 2545-2554.
- E. R. Gillies and J. M. J. Fréchet, *Drug Discovery Today* 2005; **10**: 35.
- Dual Labeling of Biomolecules by Click Chemistry: a Sequential Approach; P. Kele, G. Mezö, D. Achatz, O.S. Wolfbeis; *Angew. Chem.* 2009; **121**: 350-353; *Angew. Chem. Intl. Ed.* 2009; **48**: 344-347. DOI: 10.1002/ange.200804514.

Prices are in EUR, net, exw Germany

Properties of Dendrons

- Monodisperse macromolecules from 250 g/mole to 4400 g/mole.
- The dendron surface can be amphiphilic, hydrophilic or hydrophobic.
- Easy post modification.
- Different anchoring possibilities through a variety of available chemical functions of the focal point.

Chemical variations of the focal point

On stock available: azido, alkyne, allyl, disulfide	Conjugation with	On custom basis available: Maleinimides, biotinyl, NHS esters	Conjugation with
	Alkynes via Click reaction		SH from proteins
	Azides via Click reaction		Streptavidin
	Olefines via metathesis Other partners with UV		NH_2 of Proteins, dyes, probes and other reaction partners
	Gold surfaces SH of proteins		

On stock available:

With Azido, Alkyne, Allyl and Disulfide function at the focal point there are four functional groups available, which offer a wide variety of reactions.

On custom basis:

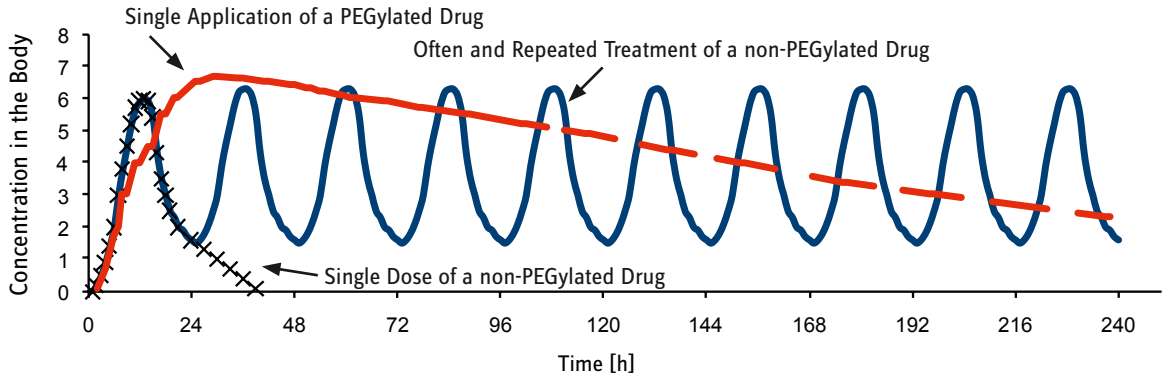
Maleinimides, Biotinyl and NHS esters are available options, which can be supplied on request.

Possible Applications of Dendrons

- Interesting versatile building block for further chemical derivatization;
- Improve drug delivery and pharmacokinetics of small molecules and biopharmaceuticals;
- Functionalization of surfaces;
- Conjugation with biopharmaceuticals, antibodies and other biologicals via disulfide bridge;
- Coupling with proteins to improve their stability towards immunogenic degradation;
- Altering enzymes to increase their chemical resistance and thermostability;
- Conjugation with dyes, fluorescence labels, spin markers and other chemical probes.

Please inquire for any other option or larger quantities!

Prices are in EUR, net, exw Germany



Pharmacokinetic properties of a PEGylated drug in comparison to a non PEGylated drug

The Reasons, why PEGylation Improves Drug Delivery and Pharmacokinetics

Small drug molecules and also large biomolecules like proteins or antibodies suffer a rapid clearance in human body. The concentration of the drug compound drops rapidly as it is removed from the body. Application has to be repeated in order to keep the concentration over a certain threshold. Otherwise immunogenic reactions start. PEGylated drugs show suppressed renal clearance and reduced immunogenic reaction, the concentration is being reduced slowly over the time of treatment. In the ideal case only a single application is required over the time of treatment. This is due to the following mechanisms:

1) Preventing Degradation and Reducing Immunogenicity:

The PEG chains cover the surface of a biopharmaceutical and thus shield effectively against attacks by the immune system. The PEG shield has characteristics rather like a solvent than a protein. This prevents uptake by cells of the retinal endothelial system (macrophage system). Therefore recognition by the immune system (antibodies, proteases and other degradation enzymes etc.) is significantly reduced. The drug stays intact and is not destroyed (degraded or metabolized) during its presence in and journey through the body.

2) Preventing Excretion:

PEG is naturally very hygroscopic and surrounded by a large solvating sphere with water. Thus the overall so-called "hydrodynamic radius" of the PEGylated biopharmaceutical compound has increased to an order of magnitude, which is larger than the diameter of the glomerular capillaries (6 to 12 nm). Therefore the drug is not excreted through the kidneys and simply stays longer in the body.

References:

- PEGylation – The Magic Wand – Turning Proteins and other Biopharmaceuticals into Super Performing Block Busters; Th. Bruckdorfer; *PharManufacturing* 2007; 34-41.
- Cancer siRNA therapy by tumor selective delivery with ligand-targeted sterically stabilized nanoparticle; R.M. Schiffelers; A. Ansari; J. Xu; Q. Zhou; Q. Tang; G. Storm; G. Molema; P.V. Scaria; M.C. Woodle; *Nucleic Acid Research* 2004; **43(19)**: 149.
- Tumor-targeted gene therapy: strategies for the preparation of ligand-polyethylene glycolpolyethyleneimine-DNA complexes; M. Ogris; G. Walker; Th. Blessing; R. Kircheis; E. Wagner; *Journal of Controlled Release* 2003; **91**: 173-181.
- Novel polymeric micelles for hydrophobic grug delivery based on biodegradable poly(hexyl-substitude lactides); Th. Trimaille; K. Mondon; R. Gurny; M. Möller; *International Journal of Pharmaceutics* 319 2006; **319**: 147-154.
- PEGylated antibodies and antibody fragments for improved therapy: a review; A.P. Chapman; *Advanced Drug Delivery Reviews* 2002; **54**: 531-545.
- P.C. Painter; M.M. Coleman; *Fundamentals of Polymer Science*, ISBN 1-56676-559-5, CRC Press, 1997; 22.

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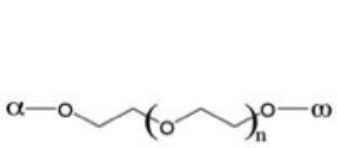
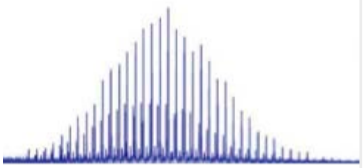
Chemical/Physical Properties and Quality Parameters of PEGs, Polydispersity

Depending, whether the polymer is consisting of one single molecular weight (only one n existing) or of a range of compounds with an average mass and a distribution of n around a mean value, PEG polymers are referred to as monodisperse or polydisperse. If the polymer is polydisperse it shows a mass spectrum as shown in the figure. In order to quantify the distribution of the molecular weight, the Polydispersity D is defined as the ratio between the weight average molecular weight M_w° and the number average molecular weight M_n°. The weight average M_w does not "count" species just by their number, but takes into account the total weight of each species and is therefore a much more realistic indicator of the gross mechanical property. For a homogeneous sample, where the polymer chains have all the same length, M_w° is equal to M_n°, the polydispersity D is then equal to 1 and the sample is referred to be monodisperse.



Poly(ethylene glycol) is a polymeric linear structure with repeating polyethylene oxide units.



Mass spectrum of a polyethylene glycol showing the typical signals with a difference of m/z = 44

$$D = \frac{M_w^\circ}{M_n^\circ} \geq 1 \text{ with } M_w^\circ = \frac{\Sigma N_x M_x^2}{\Sigma N_x M_x} \text{ and } M_n^\circ = \frac{\Sigma N_x M_x}{\Sigma N_x}$$

Whenever there is a distribution of molecular weights, the weight average M_w° is always greater than the number average M_n° and the polydispersity D is greater than 1.

Whenever there is a distribution of molecular weights, the weight average M_w° is always greater than the number average M_n° and the polydispersity D is greater than 1. The polydispersity D of PEGs typically used in PEGylation is between 1.05 and 1.50. Though, whenever a PEGylated new drug compound needs to be approved by EMEA, FDA and other authorities, it is easier and faster if this compound shows only one signal in the mass spectrum and not a distribution pattern. Therefore the need for large but monodisperse compounds is increasing.

Review Articles and additional References:

- Peptide and protein PEGYlation III: advances in chemistry and clinical applications; Francesco M. Veronese; J. Milton Harris (Editors); *Advanced Drug Delivery Reviews* 2008; **60**: 1-97.
- Chemistry for peptide and protein PEGylation; M.J. Roberts; M.D. Bentley; J.M. Harris; *Advanced Drug Delivery Reviews* 2002; **54:** 459-476.
- Peptide and protein PEGylation: a review of problems and solutions; Francesco M. Veronese; *Biomaterials* 2001; **22**: 405-417.
- A. Bückmann *et al.*; *Makromol. Chem.* 1981; **182:** 1379.
- V.N. Pillaia *et al.*; *J. Org. Chem.* 1980; **45:** 5364.
- J.M. Harris *et al.*; *J. Polym. Sci. Polym. Chem. Edn.* 1984; **22:** 341.
- S. Zalipski *et al.*; *Eur. Polym. J.* 1983; **19:** 1177.
- A. Abuchowski *et al.*; *J. Biol. Chem.* 1977; **252:** 3578.
- A. Cordes *et al.*; *J. Chromat.* 1986; **376:** 375.
- P. Wirth *et al.*; *Bioorg. Chem.* 1991; **19:** 133.
- T.P. Kogan; *Synthetic Comm.* 1992; **22:** 2417.

Summary of Chemical and Physical Properties of PEGs:

- Good solubility in BOTH hydrophilic AND hydrophobic solvents as: Water, Toluene, Methylene chloride, and many other organic solvents.
- Insoluble in: Diethyl ether, Hexane, Ethylene glycol.
- Insoluble in Water at elevated temperature.
- The solubility is influenced by forming derivatives.
- Highly mobile in water with high exclusion volume; large hydrodynamic radius.
- Form complexes with metal cations.
- Can be used to precipitate proteins and nucleic acids.
- Form two-phase system with aqueous solutions of other polymers.
- Non-toxic, FDA approved for internal consumption.

PEGylating Biopharmaceuticals and Small Molecules has the Following Effects:

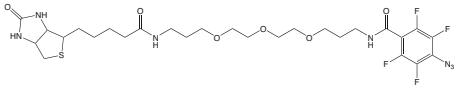
- Improves solubility of conjugated molecules.
- Renders proteins non immunogenic and tolerogenic.
- Reduces the rate of renal clearance through the kidney and alters pharmacokinetics.
- Renders surface protein rejection.
- Alters electroosmotic flow.
- Moves molecules across cell membranes.

Prices are in EUR, net, exw Germany

b) Azido-PEG Derivatives for Click Chemistry

PEG2065 Biotin-TEG-ATFBA

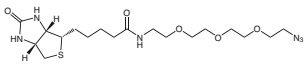
Biotin-triethylenglycol-(p-azido-tetrafluorobenzamide), 4-Azido-2,3,5,6-tetrafluoro-N-(15-oxo-19-(2-oxohexahydro-1H-thieno[3,4-d] imidazol-4-yl)-4,7,10-trioxa-14-azanonadecyl)benzamide
CAS-NO: 1264662-85-2
FORMULA: $C_{27}H_{37}F_4N_7O_6S$
MOLECULAR WEIGHT: 663,68 g/mole



Article No.	Quantity	Price
PEG2065.0025	25 mg	€ 175,00
PEG2065.0100	100 mg	€ 300,00

PEG4940 Biotin-PEG(3)-N3

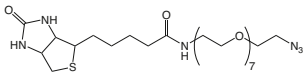
11-[D(+)-Biotinylamino]-1-azido-3,6,9-trioxaundecane
FORMULA: $C_{18}H_{32}N_6O_5S$
MOLECULAR WEIGHT: 444,55 g/mole



Article No.	Quantity	Price
PEG4940.0250	250 mg	€ 200,00
PEG4940.0001	1 g	€ 650,00

PEG4330 Biotin-dPEG™(7)-N_3

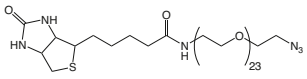
alpha-Biotin-omega-azido hepta(ethylene glycol)
CAS-NO: 1334172-75-6
FORMULA: $C_{26}H_{48}N_6O_9S$
MOLECULAR WEIGHT: 620,76 g/mole



Article No.	Quantity	Price
PEG4330.0100	100 mg	€ 225,00
PEG4330.1000	1 g	€ 1450,00

PEG4350 Biotin-dPEG™(23)-N_3

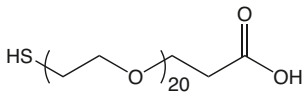
alpha-Biotin-omega-azido 23(ethylene glycol)
CAS-NO: 956494-20-5
FORMULA: $C_{58}H_{112}N_6O_{25}S$
MOLECULAR WEIGHT: 1325,6 g/mole



Article No.	Quantity	Price
PEG4350.0100	100 mg	€ 330,00
PEG4350.1000	1 g	€ 1720,00

PEG3460 HS-dPEG™(20)-COOH

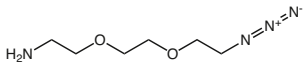
alpha-Thio-omega-(propionic acid) 20(ethylene glycol)
CAS-NO: 1032347-93-5
FORMULA: $C_{43}H_{86}O_{22}S$
MOLECULAR WEIGHT: 987,19 g/mole



Article No.	Quantity	Price
PEG3460.0100	100 mg	€ 425,00
PEG3460.1000	1 g	€ 1450,00

PEG4980 H_2N-PEG(2)-N_3*TosOH

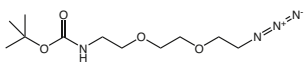
2-[2-(2-Azidoethoxy)ethoxy]ethanaminium tosylat
CAS-NO: 166388-57-4 net
FORMULA: $C_6H_{14}N_4O_2*C_6H_8O_3S$
MOLECULAR WEIGHT: 174,20*172,20 g/mole



Article No.	Quantity	Price
PEG4980.0001	1 g	€ 125,00
PEG4980.0005	5 g	€ 450,00
PEG4980.0025	25 g	€ 1800,00

PEG4960 Boc-NH-PEG(2)-N_3

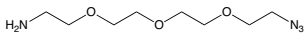
1-(t-Butyloxycarbonyl-amino)-3,6-dioxa-8-octaneazide
CAS-NO: 950683-55-3
FORMULA: $C_{11}H_{22}N_4O_4$
MOLECULAR WEIGHT: 274,32 g/mole



Article No.	Quantity	Price
PEG4960.0001	1 g	€ 125,00
PEG4960.0005	5 g	€ 450,00
PEG4960.0025	25 g	€ 1800,00

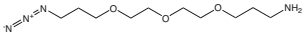
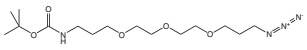
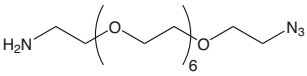
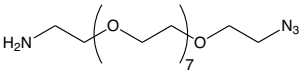
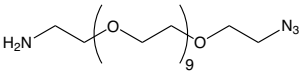
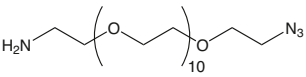
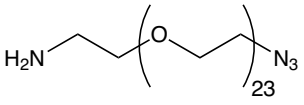
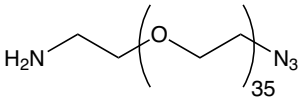
PEG3060 H_2N-PEG(3)-N_3

1-Amino-11-azido-3,6,9-trioxaundecane, 2-{2-[2-(2-Azidoethoxy) ethoxy]ethoxy}ethylamine, O-(2-Aminoethyl)-O'-(2-azidoethyl) diethylene glycol
CAS-NO: 134179-38-7
FORMULA: $C_8H_{18}N_4O_3$
MOLECULAR WEIGHT: 218,25 g/mole



Article No.	Quantity	Price
PEG3060.0100	100 mg	€ 150,00
PEG3060.0001	1 g	€ 430,00

Prices are in EUR, net, exw Germany

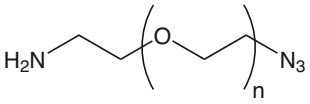
		Article No.	Quantity	Price
BNN1150 N_3-TOTA 1-Azido-4,7,10-trioxa-13-tridecanamine CAS-NO: 1162336-72-2 FORMULA: $C_{10}H_{22}N_4O_3$ MOLECULAR WEIGHT: 246,31 g/mole		BNN1150.0001 BNN1150.0005 BNN1150.0025	1 g 5 g 25 g	€ 150,00 € 500,00 € 2000,00
BNN1140 Boc-TOTA-N_3 1-(t-Butyloxycarbonyl-amino)-4,7,10-trioxa-13-tridecanazide CAS-NO: 1162070-33-8 FORMULA: $C_{15}H_{30}N_4O_5$ MOLECULAR WEIGHT: 346,42 g/mole		BNN1140.0001 BNN1140.0005 BNN1140.0025	1 g 5 g 25 g	€ 140,00 € 450,00 € 1800,00
PEG2350 H_2N-PEG(7)-N_3 alpha-Amino-omega-azido hepta(ethylene glycol) CAS-NO: 1333154-77-0 FORMULA: $C_{16}H_{34}N_4O_7$ MOLECULAR WEIGHT: 394,46 g/mole		PEG2350.0100 PEG2350.0001	100 mg 1 g	€ 225,00 € 540,00
PEG3050 H_2N-PEG(9)-N_3 alpha-Amino-omega-azido nona(ethylene glycol) FORMULA: $C_{18}H_{38}N_4O_8$ MOLECULAR WEIGHT: 438,52 g/mole		PEG3050.0001 PEG3050.0005	1 g 5 g	€ 275,00 € 975,00
PEG3040 H_2N-PEG(10)-N_3 alpha-Amino-omega-azido deca(ethylene glycol) FORMULA: $C_{22}H_{46}N_4O_{10}$ MOLECULAR WEIGHT: 526,62 g/mole		PEG3040.0001 PEG3040.0005	1 g 5 g	€ 325,00 € 1100,00
PEG1081 H_2N-PEG(11)-N_3 alpha-Amino-omega-azido undecae(ethylene glycol) CAS-NO: 749244-38-0 FORMULA: $C_{24}H_{50}N_4O_{11}$ MOLECULAR WEIGHT: 570,69 g/mole		PEG1081.0001 PEG1081.0005 PEG1081.0025	1 g 5 g 25 g	€ 350,00 € 1200,00 € 4250,00
PEG3070 H_2N-PEG(23)-N_3 alpha-Azido-omega-amino 23(ethylene glycol) CAS-NO: 749244-38-0 FORMULA: $C_{48}H_{98}N_4O_{23}$ MOLECULAR WEIGHT: 1099,3 g/mole		PEG3070.0100 PEG3070.0001	100 mg 1 g	€ 330,00 € 1340,00
PEG3080 H_2N-PEG(35)-N_3 alpha-Azido-omega-amino 35(ethylene glycol) CAS-NO: 749244-38-0 FORMULA: $C_{72}H_{146}N_4O_{35}$ MOLECULAR WEIGHT: 1627,94 g/mole		PEG3080.0100 PEG3080.0001	100 mg 1 g	€ 380,00 € 1450,00

Inquire for any other derivative. We supply **PEGylating reagents** on custom basis.

Need PEG compounds produced according to cGMP? **Please inquire!**

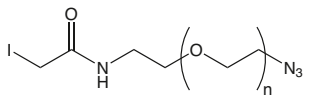
Prices are in EUR, net, exw Germany

	Article No.	Quantity	Price
PEG3010 H_2N-PEG-N_3 alpha-Amino-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da	PEG3010.0500	500 mg	€ 370,00
	PEG3010.0001	1 g	€ 610,00
PEG3030 H_2N-PEG-N_3 alpha-Amino-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da	PEG3030.0500	500 mg	€ 370,00
	PEG3030.0001	1 g	€ 610,00
PEG3000 H_2N-PEG-N_3 alpha-Amino-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da	PEG3000.0500	500 mg	€ 400,00
	PEG3000.0001	1 g	€ 675,00
PEG3020 H_2N-PEG-N_3 alpha-Amino-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da	PEG3020.0500	500 mg	€ 400,00
	PEG3020.0001	1 g	€ 675,00



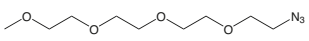
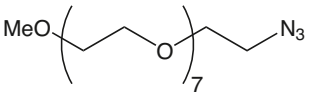
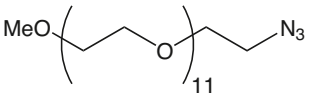
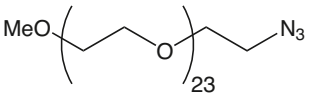
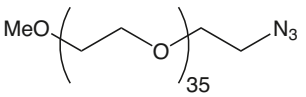
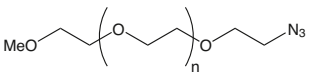
Whenever thiol groups from Cysteine or other SH carrying moieties are used for conjugation, maleinimides are normally used, which react also with other acidic proton carrying functions, for example COOH, OH or NH_2 and give appropriate unwanted impurities. The iodo group reacts much more specifically with thiol resulting in much cleaner conjugates.

	Article No.	Quantity	Price
PEG3150 I-PEG-N_3 alpha-Iodo-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da	PEG3150.0100	100 mg	€ 225,00
	PEG3150.0500	500 mg	€ 625,00
PEG3160 I-PEG-N_3 alpha-Iodo-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da	PEG3160.0100	100 mg	€ 225,00
	PEG3160.0500	500 mg	€ 625,00
PEG3130 I-PEG-N_3 alpha-Iodo-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da	PEG3130.0100	100 mg	€ 250,00
	PEG3130.0500	500 mg	€ 675,00
PEG3140 I-PEG-N_3 alpha-Iodo-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da	PEG3140.0100	100 mg	€ 250,00
	PEG3140.0500	500 mg	€ 675,00



▶ Quantitative reactivity profiling predicts functional cysteins in proteomes; K. Weerapana, C. Wang, G.M. Simon, F. Richter, S. Khare, M.B.D. Dillon, D.A. Bachovichin, K. Mowen, D. Baker, B.J. Cravatt; *Nature* 2010; **468:** 790-795.

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PEG1690 MeO-dPEG(4)-N_3 13-Azido-2,5,8,11-tetraoxa-tridecane CAS-NO: 606130-90-9 MOLECULAR WEIGHT: 233,26 g/mole		PEG1690.0100 PEG1690.0001	100 mg 1 g	€ 175,00 € 540,00
PEG1705 MeO-dPEG(8)-N_3 2,5,8,11,14,17,20,23-Octaoxapentacosan-25-amine CAS-NO: 869718-80-9 MOLECULAR WEIGHT: 409,48 g/mole		PEG1705.0100 PEG1705.0001	100 mg 1 g	€ 200,00 € 650,00
PEG1660 MeO-dPEG(12)-N_3 37-Azido-2,5,8,11,14,17,20,23,26,29,32,35-dodecaoxaheptatriacontane CAS-NO: 89485-61-0 MOLECULAR WEIGHT: 585,69 g/mole		PEG1660.0100 PEG1660.0001	100 mg 1 g	€ 250,00 € 750,00
PEG1710 MeO-dPEG(24)-N_3 alpha-Methoxy-omega-azido-24(ethylene glycol) CAS-NO: 89485-61-0 MOLECULAR WEIGHT: 1114,34 g/mole		PEG1710.0100 PEG1710.0001	100 mg 1 g	€ 300,00 € 860,00
PEG3430 MeO-dPEG™(36)-N_3 alpha-Methoxy-omega-azido-36(ethylene glycol) CAS-NO: 89485-61-0 MOLECULAR WEIGHT: 1642,95 g/mole		PEG3430.0100 PEG3430.1000	100 mg 1 g	€ 330,00 € 1070,00
PEG1219 MeO-PEG-N_3 alpha-Methoxy-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 750 Da		PEG1219.0500 PEG1219.0001	500 mg 1 g	€ 230,00 € 400,00
PEG1225 MeO-PEG-N_3 alpha-Methoxy-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 2000 Da		PEG1225.0500 PEG1225.0001	500 mg 1 g	€ 110,00 € 200,00
PEG2040 MeO-PEG-N_3 alpha-Methoxy-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da		PEG2040.0500 PEG2040.0001	500 mg 1 g	€ 110,00 € 200,00
PEG2045 MeO-PEG-N_3 alpha-Methoxy-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da		PEG2045.0500 PEG2045.0001	500 mg 1 g	€ 140,00 € 225,00
PEG2050 MeO-PEG-N_3 alpha-Methoxy-omega-azido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da		PEG2050.0500 PEG2050.0001	500 mg 1 g	€ 140,00 € 225,00

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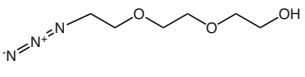
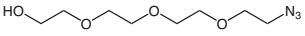
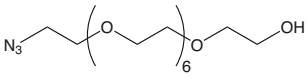
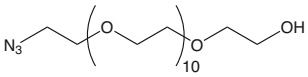
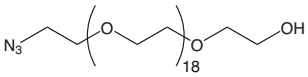
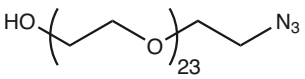
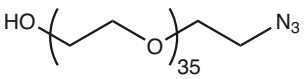
		Article No.	Quantity	Price
PEG4900 N_3-EEEt-OH 2-[2-(2-Azidoethoxy)ethoxy]ethanol CAS-NO: 86520-52-7 MOLECULAR WEIGHT: 175,19 g/mole		PEG4900.0001 PEG4900.0005 PEG4900.0025	1 g 5 g 25 g	€ 125,00 € 350,00 € 1400,00
PEG3760 N_3-dPEG™(4)-OH alpha-Azido-omega-hydroxy tetra(ethylene glycol) CAS-NO: 86770-67-4 MOLECULAR WEIGHT: 219,24 g/mole		PEG3760.1000	1 g	€ 225,00
PEG1088 N_3-PEG(8)-OH alpha-Azido-omega-hydroxy octa(ethylene glycol) CAS-NO: 352439-36-2 MOLECULAR WEIGHT: 395,45 g/mole		PEG1088.0001 PEG1088.0005	1 g 5 g	€ 300,00 € 900,00
PEG1390 N_3-dPEG(12)-OH 35-Azido-3,6,9,12,15,18,21,24,27,30,33-undecaoxapentatriacontan-1-ol CAS-NO: 73342-16-2 MOLECULAR WEIGHT: 571,66 g/mole		PEG1390.0100 PEG1390.0001	100 mg 1 g	€ 250,00 € 650,00
PEG1220 N_3-PEG(20)-OH alpha-Azido-omega-hydroxy icosa(ethylene glycol) MOLECULAR WEIGHT: 924,1 g/mole		PEG1220.0001 PEG1220.0005	1 g 5 g	€ 325,00 € 975,00
PEG3770 N_3-dPEG™(24)-OH alpha-Azido-omega-hydroxy 24(ethylene glycol) CAS-NO: 73342-16-2 MOLECULAR WEIGHT: 1100,29 g/mole		PEG3770.0100 PEG3770.1000	100 mg 1 g	€ 350,00 € 1070,00
PEG3780 N_3-dPEG™(36)-OH alpha-Azido-omega-hydroxy 36(ethylene glycol) CAS-NO: 73342-16-2 MOLECULAR WEIGHT: 1628,92 g/mole		PEG3780.0100 PEG3780.1000	100 mg 1 g	€ 380,00 € 1180,00

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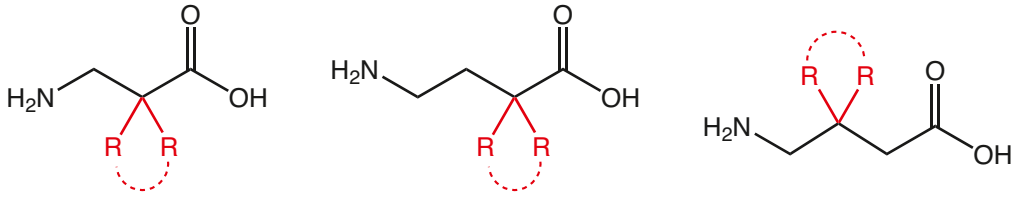
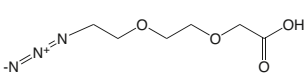
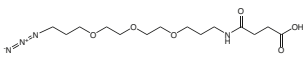
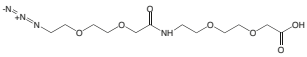
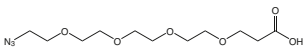
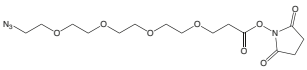
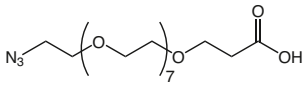
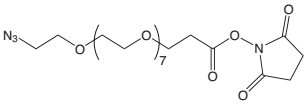
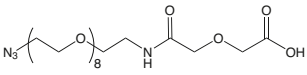
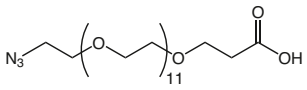


Custom synthesis of 2,2- and 3,3-disubstituted homo and gamma amino acids.

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PEG2780 **N_3-O2Oc-OH*CHA** 8-Azido-3,6-dioxaoctanoic acid cyclohexylamine, 2-(2-Azidoethoxy)-ethoxyacetic acid cyclohexylamine CAS-NO: 88518-90-3 net MOLECULAR WEIGHT: 189.17*99.17 g/mole		PEG2780.0001 PEG2780.0005 PEG2780.0025	1 g 5 g 25 g	€ 150,00 € 500,00 € 2000,00
PEG5170 **N_3-TOTA-Suc** 1-Azido-4,7,10-trioxa-13-tridecaneamine succinamic acid MOLECULAR WEIGHT: 346,38 g/mole		PEG5170.0001 PEG5170.0005 PEG5170.0025	1 g 5 g 25 g	€ 190,00 € 750,00 € 3000,00
PEG2790 **N_3-O2Oc-O2Oc-OH** 8-(8-Azido-3,6-dioxaoctanoylamido)-3,6-dioxaoctanoic acid MOLECULAR WEIGHT: 334.33 g/mole		PEG2790.0001 PEG2790.0005	1 g 5 g	€ 400,00 € 1600,00
PEG2345 **N_3-PEG(4)-COOH** 15-Azido-4,7,10,13-tetraoxa-pentadecanoic acid CAS-NO: 1257063-35-6 MOLECULAR WEIGHT: 291,3 g/mole		PEG2345.0100 PEG2345.0001 PEG2345.0005	100 mg 1 g 5 g	€ 110,00 € 350,00 € 1400,00
PEG1400 **N_3-dPEG(4)-NHS** 15-Azido-4,7,10,13-tetraoxa-pentadecanoic acid succinimidyl ester CAS-NO: 944251-24-5 MOLECULAR WEIGHT: 388,37 g/mole		PEG1400.0100 PEG1400.0001	100 mg 1 g	€ 200,00 € 970,00
PEG4170 **N_3-dPEG™(8)-COOH** alpha-Azido-omega-(propionic acid) octa(ethylene glycol) CAS-NO: 1214319-92-2 MOLECULAR WEIGHT: 467,51 g/mole		PEG4170.0100 PEG4170.1000	100 mg 1 g	€ 250,00 € 1180,00
PEG1405 **N_3-dPEG(8)-NHS** 1-Azido-3,6,9,12,15,18,21,24-octaoxaheptacosan-27-oic acid succin-imidyl ester CAS-NO: 1204834-00-3 MOLECULAR WEIGHT: 564,58 g/mole		PEG1405.0100 PEG1405.0001	100 mg 1 g	€ 225,00 € 1130,00
PEG2015 **N_3-PEG(9)-COOH** 14-azido-5-oxo-3,9,12-trioxa-6-azatetradecan-1-oic acid MOLECULAR WEIGHT: 554,59 g/mole		PEG2015.0001 PEG2015.0005	1 g 5 g	€ 400,00 € 1350,00
PEG4180 **N_3-dPEG™(12)-COOH** alpha-Azido-omega-(propionic acid) dodeca(ethylene glycol) CAS-NO: 1167575-20-3 MOLECULAR WEIGHT: 643,72 g/mole		PEG4180.0100 PEG4180.1000	100 mg 1 g	€ 270,00 € 1230,00

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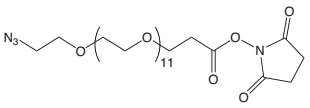
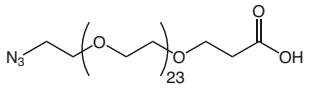
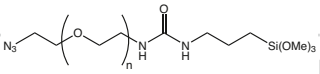
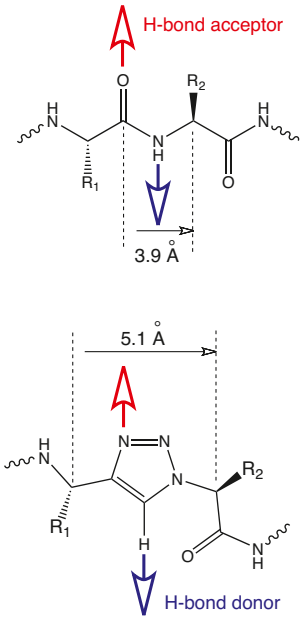
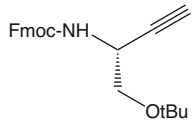
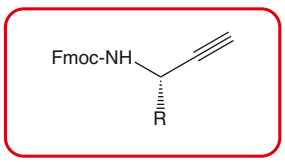
		Article No.	Quantity	Price
PEG1395 **N_3-dPEG(12)-NHS** 1-Azido-3,6,9,12,15,18,21,24,27,30,33,36-dodecaoxanonatriacontan-39-oic acid succinimidyl ester CAS-NO: 1108750-59-9 MOLECULAR WEIGHT: 740,79 g/mole		PEG1395.0100 PEG1395.0001	100 mg 1 g	€ 250,00 € 1210,00
PEG4190 **N_3-dPEG™(24)-COOH** alpha-Azido-omega-(propionic acid) 24(ethylene glycol) CAS-NO: 1167575-20-3 MOLECULAR WEIGHT: 1172,35 g/mole		PEG4190.0100 PEG4190.1000	100 mg 1 g	€ 300,00 € 1290,00
PEG4830 **Azido-PEG-Si(OMe)$_3$** alpha-Azido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da		PEG4830.0500 PEG4830.1000	500 mg 1 g	€ 500,00 € 900,00
PEG4835 **Azido-PEG-Si(OMe)$_3$** alpha-Azido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da		PEG4835.0500 PEG4835.1000	500 mg 1 g	€ 500,00 € 900,00
PEG4840 **Azido-PEG-Si(OMe)$_3$** alpha-Azido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da		PEG4840.0500 PEG4840.1000	500 mg 1 g	€ 500,00 € 900,00
PEG4845 **Azido-PEG-Si(OMe)$_3$** alpha-Azido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da		PEG4845.0500 PEG4845.1000	500 mg 1 g	€ 500,00 € 900,00





Fmoc-Ser(tBu)-OH Click Analogue

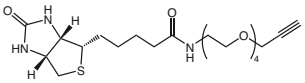
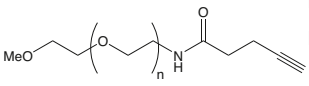
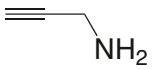
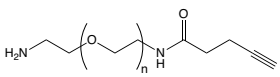


Ala, Arg(Pbf), Asn(Trt) ..... Trp(Boc), Tyr(tBu), Val

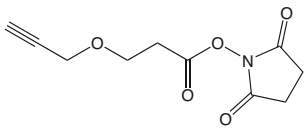
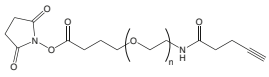
Custom synthesis of various alkyne amino acids analogues.

Prices are in EUR, net, exw Germany

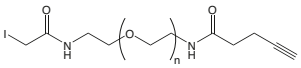
c) Alkyne-PEG Derivatives for Click Chemistry

		Article No.	Quantity	Price
PEG4950 Biotin-PEG(4)-alkyne 15-[D(+)-Biotinylamino]-4,7,10,13-tetraoxapentadec-1-yne MOLECULAR WEIGHT: 457,58 g/mole		PEG4950.0250 PEG4950.0001	250 mg 1 g	€ 200,00 € 650,00
PEG2840 MeO-PEG-alkyne alpha-Methoxy-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 750 Da		PEG2840.0500 PEG2840.0001	500 mg 1 g	€ 230,00 € 400,00
PEG2810 MeO-PEG-alkyne alpha-Methoxy-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 2000 Da		PEG2810.0500 PEG2810.0001	500 mg 1 g	€ 110,00 € 200,00
PEG2830 MeO-PEG-alkyne alpha-Methoxy-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da		PEG2830.0500 PEG2830.0001	500 mg 1 g	€ 110,00 € 200,00
PEG2800 MeO-PEG-alkyne alpha-Methoxy-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da		PEG2800.0500 PEG2800.0001	500 mg 1 g	€ 140,00 € 225,00
PEG2820 MeO-PEG-alkyne alpha-Methoxy-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da		PEG2820.0500 PEG2820.0001	500 mg 1 g	€ 140,00 € 225,00
PEG2755 Propargyl amine Propargyl amine CAS-NO: 2450-71-7 MOLECULAR WEIGHT: 55,08 g/mole		PEG2755.0005 PEG2755.0025	5 g 25 g	€ 175,00 € 350,00
PEG2960 H_2N-PEG-alkyne alpha-Amino-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da		PEG2960.0500 PEG2960.0001	500 mg 1 g	€ 370,00 € 610,00
PEG2980 H_2N-PEG-alkyne alpha-Amino-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da		PEG2980.0500 PEG2980.0001	500 mg 1 g	€ 370,00 € 610,00
PEG2950 H_2N-PEG-alkyne alpha-Amino-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da		PEG2950.0500 PEG2950.0001	500 mg 1 g	€ 400,00 € 675,00
PEG2970 H_2N-PEG-alkyne alpha-Amino-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da		PEG2970.0500 PEG2970.0001	500 mg 1 g	€ 400,00 € 675,00

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PEG1935 Propargyl-NHS 3-(Prop-2-ynyloxy)propanoic acid succinimidyl ester CAS-NO: 1174157-65-3 MOLECULAR WEIGHT: 225,2 g/mole		PEG1935.0100	100 mg	€ 150,00
		PEG1935.0001	1 g	€ 490,00
PEG2860 NHS-PEG-alkyne alpha-Succinimidyl ester-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da		PEG2860.0500	500 mg	€ 475,00
		PEG2860.0001	1 g	€ 825,00
PEG2880 NHS-PEG-alkyne alpha-Succinimidyl ester-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da		PEG2880.0500	500 mg	€ 475,00
		PEG2880.0001	1 g	€ 825,00
PEG2850 NHS-PEG-alkyne alpha-Succinimidyl ester-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da		PEG2850.0500	500 mg	€ 500,00
		PEG2850.0001	1 g	€ 880,00
PEG2870 NHS-PEG-alkyne alpha-Succinimidyl ester-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da		PEG2870.0500	500 mg	€ 500,00
		PEG2870.0001	1 g	€ 880,00

In conjugation techniques with thiol groups from Cystein or other SH carrying moieties normally maleinimides are used, which react also with other acid protons like for example from OH or NH_2 and give appropriate unwanted impurities. The iodo group reacts much more specifically with thiol resulting in much cleaner conjugates.

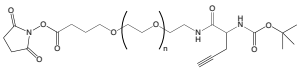
		Article No.	Quantity	Price
PEG3110 I-PEG-alkyne alpha-Iodo-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da		PEG3110.0100	100 mg	€ 225,00
		PEG3110.0500	500 mg	€ 625,00
PEG3120 I-PEG-alkyne alpha-Iodo-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da		PEG3120.0100	100 mg	€ 225,00
		PEG3120.0500	500 mg	€ 625,00
PEG3090 I-PEG-alkyne alpha-Iodo-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da		PEG3090.0100	100 mg	€ 250,00
		PEG3090.0500	500 mg	€ 675,00
PEG3100 I-PEG-alkyne alpha-Iodo-omega-propargylacetamido poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da		PEG3100.0100	100 mg	€ 250,00
		PEG3100.0500	500 mg	€ 675,00

Reference:

- Quantitative reactivity profiling predicts functional cysteins in proteomes; K. Weerapana, C. Wang, G.M. Simon, F. Richter, S. Khare, M.B.D. Dillon, D.A. Bachovichin, K. Mowen, D. Baker, B.J. Cravatt; *Nature* 2010; **468**: 790-795.

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PEG2910	**NHS-PEG(NH-Boc)-alkyne** alpha-Succinimidyl ester-omega-(N-t-Butyloxycarbonyl-L-propargyl-glycinyl) poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da	PEG2910.0500	500 mg	€ 500,00
		PEG2910.0001	1 g	€ 880,00
PEG2930	**NHS-PEG(NH-Boc)-alkyne** alpha-Succinimidyl ester-omega-(N-t-Butyloxycarbonyl-L-propargyl-glycinyl) poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da	PEG2930.0500	500 mg	€ 500,00
		PEG2930.0001	1 g	€ 880,00
PEG2900	**NHS-PEG(NH-Boc)-alkyne** alpha-Succinimidyl ester-omega-(N-t-Butyloxycarbonyl-L-propargyl-glycinyl) poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da	PEG2900.0500	500 mg	€ 550,00
		PEG2900.0001	1 g	€ 960,00
PEG2920	**NHS-PEG(NH-Boc)-alkyne** alpha-Succinimidyl ester-omega-(N-t-Butyloxycarbonyl-L-propargyl-glycinyl) poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da	PEG2920.0500	500 mg	€ 550,00
		PEG2920.0001	1 g	€ 960,00

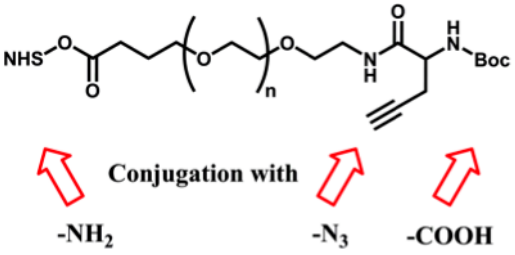


Tri-functional PEG carrying three orthogonal reactive groups:

1. The NHS group can react with nucleophiles like amines or alcohols.
2. At the Boc-Amino position the free amino group (after removal of the Boc protecting group) can form a stable amide bond with activated esters.
3. Finally the alkyne function is still free for the Click reaction with a third partner.

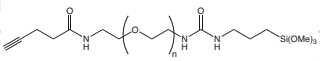
Two interacting partners like protein and receptor can be conjugated in this way and the interaction monitored by attaching a dye, fluorescence dye, NMR or spin label for highly sophisticated experiments.

Tri-functional PEGylating Reagent



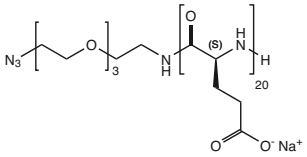
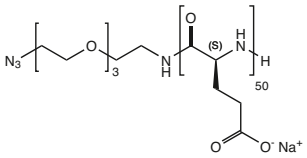
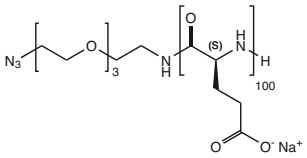
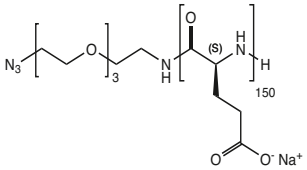
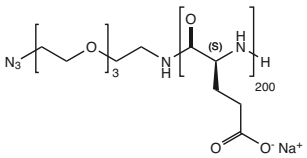
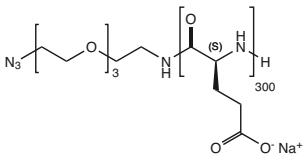
α-Succinimidyl ester-ω-(N-t-Butyloxycarbonyl-L-propargyl-glycinyl) poly(ethylene glycol)

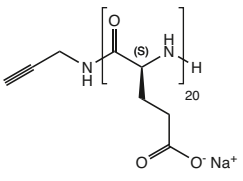
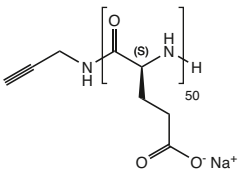
		Article No.	Quantity	Price
PEG4810	**Alkyne-PEG-Si(OMe)$_3$** alpha-Propargylacetamido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 3000 Da	PEG4810.0500	500 mg	€ 500,00
		PEG4810.1000	1 g	€ 900,00
PEG4815	**Alkyne-PEG-Si(OMe)$_3$** alpha-Propargylacetamido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 5000 Da	PEG4815.0500	500 mg	€ 500,00
		PEG4815.1000	1 g	€ 900,00
PEG4820	**Alkyne-PEG-Si(OMe)$_3$** alpha-Propargylacetamido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 10000 Da	PEG4820.0500	500 mg	€ 500,00
		PEG4820.1000	1 g	€ 900,00
PEG4825	**Alkyne-PEG-Si(OMe)$_3$** alpha-Propargylacetamido-omega-trimethoxysilyl poly(ethylene glycol) MOLECULAR WEIGHT: 20000 Da	PEG4825.0500	500 mg	€ 500,00
		PEG4825.1000	1 g	€ 900,00



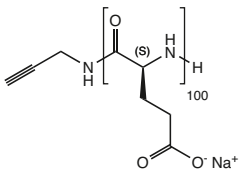
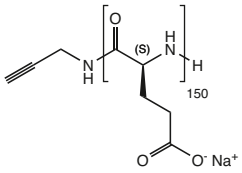
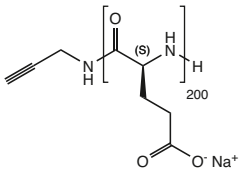
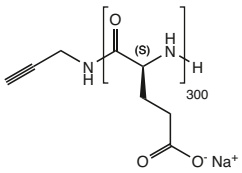
Prices are in EUR, net, exw Germany

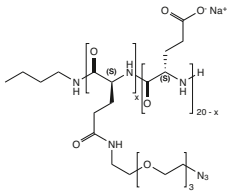
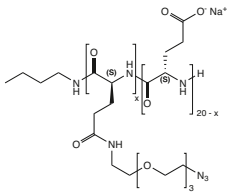
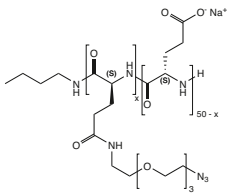
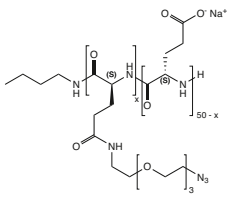
d) Poly(Amino Acids) for Click Chemistry

		Article No.	Quantity	Price
PGA1125 **N_3-PGA(20)Na** Azido-ethyltri(ethylene glycol)-poly(L-glutamic acid) sodium salt (MW 3000Da) MOLECULAR WEIGHT: 3000 Da		PGA1125.0100	100 mg	€ 145,00
		PGA1125.0500	500 mg	€ 280,00
		PGA1125.1000	1 g	€ 500,00
		PGA1125.5000	5 g	€ 2100,00
PGA1130 **N_3-PGA(50)Na** Azido-ethyltri(ethylene glycol)-poly(L-glutamic acid) sodium salt (MW 7500Da) MOLECULAR WEIGHT: 7500 Da		PGA1130.0100	100 mg	€ 145,00
		PGA1130.0500	500 mg	€ 280,00
		PGA1130.1000	1 g	€ 500,00
		PGA1130.5000	5 g	€ 2100,00
PGA1135 **N_3-PGA(100)Na** Azido-ethyltri(ethylene glycol)-poly(L-glutamic acid) sodium salt (MW 15000Da) MOLECULAR WEIGHT: 15000 Da		PGA1135.0100	100 mg	€ 145,00
		PGA1135.0500	500 mg	€ 280,00
		PGA1135.0001	1 g	€ 500,00
		PGA1135.0005	5 g	€ 2100,00
PGA1137 **N_3-PGA(150)Na** Azido-ethyltri(ethylene glycol)-poly(L-glutamic acid) sodium salt (MW 22700Da) MOLECULAR WEIGHT: 22700 Da		PGA1137.0100	100 mg	€ 145,00
		PGA1137.0500	500 mg	€ 280,00
		PGA1137.1000	1 g	€ 500,00
		PGA1137.5000	5 g	€ 2100,00
PGA1140 **N_3-PGA(200)Na** Azido-ethyltri(ethylene glycol)-poly(L-glutamic acid) sodium salt (MW 30000Da) MOLECULAR WEIGHT: 30000 Da		PGA1140.0100	100 mg	€ 145,00
		PGA1140.0500	500 mg	€ 280,00
		PGA1140.1000	1 g	€ 500,00
		PGA1140.5000	5 g	€ 2100,00
PGA1145 **N_3-PGA(300)Na** Azido-ethyltri(ethylene glycol)-poly(L-glutamic acid) sodium salt (MW 45000Da) MOLECULAR WEIGHT: 45000 Da		PGA1145.0100	100 mg	€ 145,00
		PGA1145.0500	500 mg	€ 280,00
		PGA1145.1000	1 g	€ 500,00
		PGA1145.5000	5 g	€ 2100,00

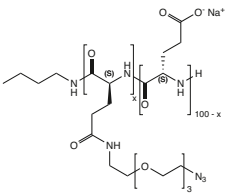
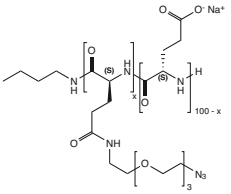
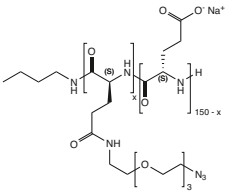
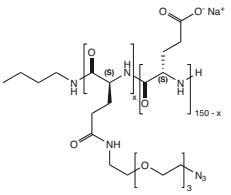
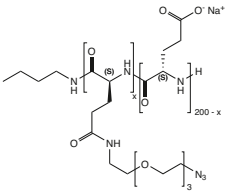
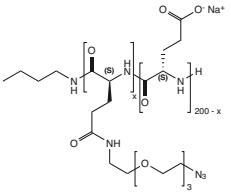
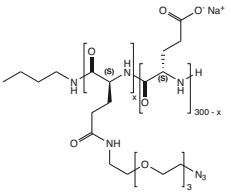
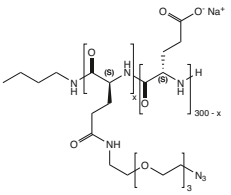
		Article No.	Quantity	Price
PGA1085 **Prg-PGA(20)Na** Propargyl-poly(L-glutamic acid) sodium salt (MW 3000Da) MOLECULAR WEIGHT: 3000 Da		PGA1085.0100	100 mg	€ 145,00
		PGA1085.0500	500 mg	€ 260,00
		PGA1085.1000	1 g	€ 450,00
		PGA1085.5000	5 g	€ 1850,00
		PGA1085.9001	10 g	€ 3200,00
PGA1090 **Prg-PGA(50)Na** Propargyl-poly(L-glutamic acid) sodium salt (MW 7600Da) MOLECULAR WEIGHT: 7600 Da		PGA1090.0100	100 mg	€ 145,00
		PGA1090.0500	500 mg	€ 260,00
		PGA1090.1000	1 g	€ 450,00
		PGA1090.5000	5 g	€ 1850,00
		PGA1090.9001	10 g	€ 3200,00

Prices are in EUR, net, exw Germany

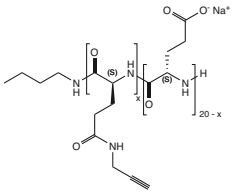
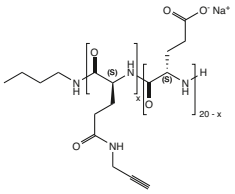
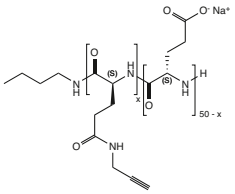
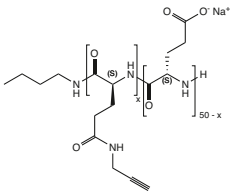
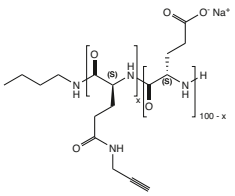
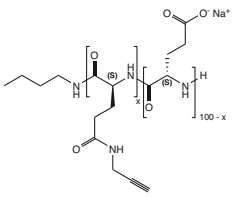
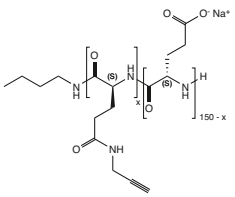
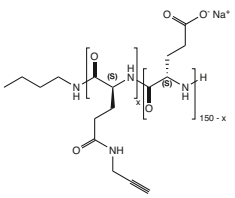
		Article No.	Quantity	Price
PGA1095 Prg-PGA(100)Na Propargyl-poly(L-glutamic acid) sodium salt (MW 15100Da) MOLECULAR WEIGHT: 15100 Da		PGA1095.0100	100 mg	€ 145,00
		PGA1095.0500	500 mg	€ 260,00
		PGA1095.0001	1 g	€ 450,00
		PGA1095.0005	5 g	€ 1850,00
		PGA1095.0010	10 g	€ 3200,00
PGA1097 Prg-PGA(150)Na Propargyl-poly(L-glutamic acid) sodium salt (MW 22700Da) MOLECULAR WEIGHT: 22700 Da		PGA1097.0100	100 mg	€ 145,00
		PGA1097.0500	500 mg	€ 260,00
		PGA1097.1000	1 g	€ 450,00
		PGA1097.5000	5 g	€ 1850,00
		PGA1097.9001	10 g	€ 3200,00
PGA1100 Prg-PGA(200)Na Propargyl-poly(L-glutamic acid) sodium salt (MW 30200Da) MOLECULAR WEIGHT: 30200 Da		PGA1100.0100	100 mg	€ 145,00
		PGA1100.0500	500 mg	€ 260,00
		PGA1100.1000	1 g	€ 450,00
		PGA1100.5000	5 g	€ 1850,00
		PGA1100.9001	10 g	€ 3200,00
PGA1105 Prg-PGA(300)Na Propargyl-poly(L-glutamic acid) sodium salt (MW 45300Da) MOLECULAR WEIGHT: 45300 Da		PGA1105.0100	100 mg	€ 145,00
		PGA1105.0500	500 mg	€ 260,00
		PGA1105.1000	1 g	€ 450,00
		PGA1105.5000	5 g	€ 1850,00
		PGA1105.9001	10 g	€ 3200,00

PGA1265 nBu-PGA(20)[Azid(10)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (5-10 mol% azido substitution, MW 3100Da) MOLECULAR WEIGHT: 3100 Da		PGA1265.0100	100 mg	€ 375,00
		PGA1265.0500	500 mg	€ 750,00
		PGA1265.1000	1 g	€ 1275,00
PGA1290 nBu-PGA(20)[Azid(20)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (10-20 mol% azido substitution, MW 3300Da) MOLECULAR WEIGHT: 3300 Da		PGA1290.0100	100 mg	€ 525,00
		PGA1290.0500	500 mg	€ 975,00
		PGA1290.1000	1 g	€ 1450,00
PGA1270 nBu-PGA(50)[Azid(10)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (5-10 mol% azido substitution, MW 7700Da) MOLECULAR WEIGHT: 7700 Da		PGA1270.0100	100 mg	€ 375,00
		PGA1270.0500	500 mg	€ 750,00
		PGA1270.1000	1 g	€ 1275,00
PGA1295 nBu-PGA(50)[Azid(20)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (10-20 mol% azido substitution, MW 8300Da) MOLECULAR WEIGHT: 8300 Da		PGA1295.0100	100 mg	€ 525,00
		PGA1295.0500	500 mg	€ 975,00
		PGA1295.1000	1 g	€ 1450,00

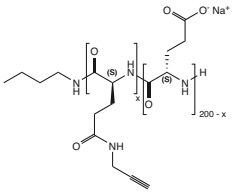
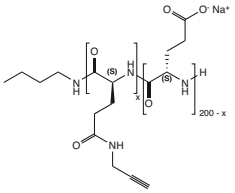
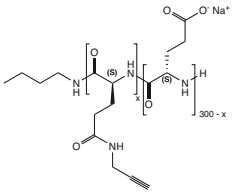
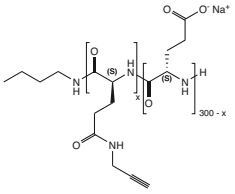
Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PGA1275 nBu-PGA(100)[Azid(10)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (5-10 mol% azido substitution, MW 15300Da) MOLECULAR WEIGHT: 15300 Da		PGA1275.0100 PGA1275.0500 PGA1275.1000	100 mg 500 mg 1 g	€ 375,00 € 750,00 € 1275,00
PGA1300 nBu-PGA(100)[Azid(20)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (10-20 mol% azido substitution, MW 16600Da) MOLECULAR WEIGHT: 16600 Da		PGA1300.0100 PGA1300.0500 PGA1300.1000	100 mg 500 mg 1 g	€ 525,00 € 975,00 € 1450,00
PGA1277 nBu-PGA(150)[Azid(10)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (5-10 mol% azido substitution, MW 23000Da) MOLECULAR WEIGHT: 23000 Da		PGA1277.0100 PGA1277.0500 PGA1277.1000	100 mg 500 mg 1 g	€ 375,00 € 750,00 € 1275,00
PGA1302 nBu-PGA(150)[Azid(20)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (10-20 mol% azido substitution, MW 24800Da) MOLECULAR WEIGHT: 24800 Da		PGA1302.0100 PGA1302.0500 PGA1302.1000	100 mg 500 mg 1 g	€ 525,00 € 975,00 € 1450,00
PGA1280 nBu-PGA(200)[Azid(10)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (5-10 mol% azido substitution, MW 30600Da) MOLECULAR WEIGHT: 30600 Da		PGA1280.0100 PGA1280.0500 PGA1280.1000	100 mg 500 mg 1 g	€ 375,00 € 750,00 € 1275,00
PGA1305 nBu-PGA(200)[Azid(20)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (10-20 mol% azido substitution, MW 33100Da) MOLECULAR WEIGHT: 33100 Da		PGA1305.0100 PGA1305.0500 PGA1305.1000	100 mg 500 mg 1 g	€ 525,00 € 975,00 € 1450,00
PGA1282 nBu-PGA(300)[Azid(10)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (5-10 mol% azido substitution, MW 45900Da) MOLECULAR WEIGHT: 45900 Da		PGA1282.0100 PGA1282.0500 PGA1282.1000	100 mg 500 mg 1 g	€ 375,00 € 750,00 € 1275,00
PGA1307 nBu-PGA(300)[Azid(20)] n-Butyl-poly(L-glutamic acid gamma-azido-ethyltri(ethylene glycol) amide) sodium salt (10-20 mol% azido substitution, MW 49700Da) MOLECULAR WEIGHT: 49700 Da		PGA1307.0100 PGA1307.0500 PGA1307.1000	100 mg 500 mg 1 g	€ 525,00 € 975,00 € 1450,00

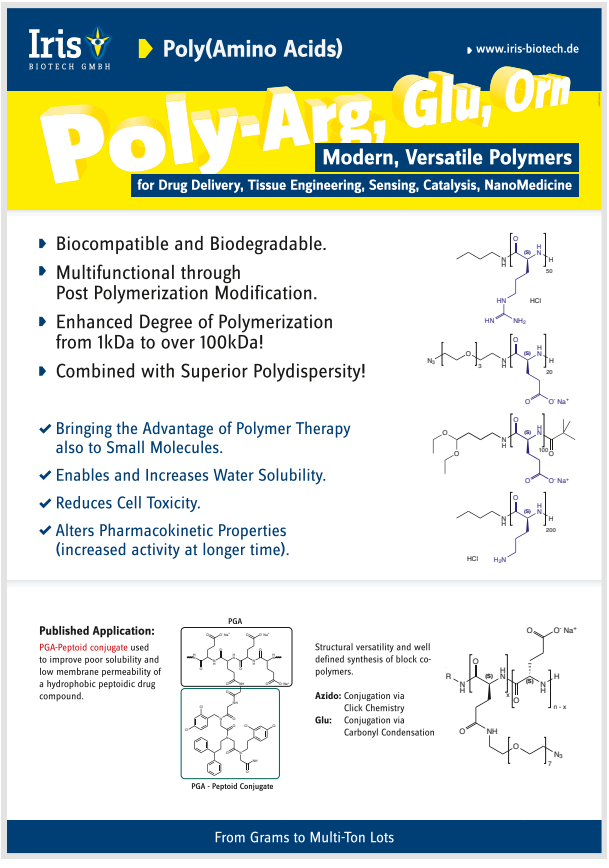
Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PGA1165 **nBu-PGA(20)[Prg(10)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (5-10 mol% propargyl substitution, MW 3000Da) MOLECULAR WEIGHT: 3000 Da		PGA1165.0100	100 mg	€ 275,00
		PGA1165.0500	500 mg	€ 675,00
		PGA1165.1000	1 g	€ 925,00
		PGA1165.5000	5 g	€ 3200,00
PGA1190 **nBu-PGA(20)[Prg(20)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (10-20 mol% propargyl substitution, MW 3000Da) MOLECULAR WEIGHT: 3000 Da		PGA1190.0100	100 mg	€ 325,00
		PGA1190.0500	500 mg	€ 775,00
		PGA1190.1000	1 g	€ 1100,00
		PGA1190.5000	5 g	€ 3200,00
PGA1170 **nBu-PGA(50)[Prg(10)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (5-10 mol% propargyl substitution, MW 7500Da) MOLECULAR WEIGHT: 7500 Da		PGA1170.0100	100 mg	€ 275,00
		PGA1170.0500	500 mg	€ 675,00
		PGA1170.1000	1 g	€ 925,00
		PGA1170.5000	5 g	€ 3200,00
PGA1195 **nBu-PGA(50)[Prg(20)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (10-20 mol% propargyl substitution, MW 7500Da) MOLECULAR WEIGHT: 7500 Da		PGA1195.0100	100 mg	€ 325,00
		PGA1195.0500	500 mg	€ 775,00
		PGA1195.1000	1 g	€ 1100,00
		PGA1195.5000	5 g	€ 3200,00
PGA1175 **nBu-PGA(100)[Prg(10)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (5-10 mol% propargyl substitution, MW 15000Da) MOLECULAR WEIGHT: 15000 Da		PGA1175.0100	100 mg	€ 275,00
		PGA1175.0500	500 mg	€ 675,00
		PGA1175.1000	1 g	€ 925,00
		PGA1175.5000	5 g	€ 3200,00
PGA1200 **nBu-PGA(100)[Prg(20)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (10-20 mol% propargyl substitution, MW 15000Da) MOLECULAR WEIGHT: 15000 Da		PGA1200.0100	100 mg	€ 325,00
		PGA1200.0500	500 mg	€ 775,00
		PGA1200.1000	1 g	€ 1100,00
		PGA1200.5000	5 g	€ 3200,00
PGA1177 **nBu-PGA(150)[Prg(10)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (5-10 mol% propargyl substitution, MW 23000Da) MOLECULAR WEIGHT: 23000 Da		PGA1177.0100	100 mg	€ 275,00
		PGA1177.0500	500 mg	€ 675,00
		PGA1177.1000	1 g	€ 925,00
		PGA1177.5000	5 g	€ 3200,00
PGA1202 **nBu-PGA(150)[Prg(20)]Na** n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (10-20 mol% propargyl substitution, MW 24800Da) MOLECULAR WEIGHT: 24800 Da		PGA1202.0100	100 mg	€ 325,00
		PGA1202.0500	500 mg	€ 775,00
		PGA1202.1000	1 g	€ 1100,00
		PGA1202.5000	5 g	€ 3200,00

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
PGA1180	**nBu-PGA(200)[Prg(10)]Na**			
n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (5-10 mol% propargyl substitution, MW 30000Da) MOLECULAR WEIGHT: 30000 Da		PGA1180.0100	100 mg	€ 275,00
		PGA1180.0500	500 mg	€ 675,00
		PGA1180.1000	1 g	€ 925,00
		PGA1180.5000	5 g	€ 3200,00
PGA1205	**nBu-PGA(200)[Prg(20)]Na**			
n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (10-20 mol% propargyl substitution, MW 30000Da) MOLECULAR WEIGHT: 30000 Da		PGA1205.0100	100 mg	€ 325,00
		PGA1205.0500	500 mg	€ 775,00
		PGA1205.1000	1 g	€ 1100,00
		PGA1205.5000	5 g	€ 3200,00
PGA1182	**nBu-PGA(300)[Prg(10)]Na**			
n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (5-10 mol% propargyl substitution, MW 45900Da) MOLECULAR WEIGHT: 45900 Da		PGA1182.0100	100 mg	€ 275,00
		PGA1182.0500	500 mg	€ 675,00
		PGA1182.1000	1 g	€ 925,00
		PGA1182.5000	5 g	€ 3200,00
PGA1207	**nBu-PGA(300)[Prg(20)]Na**			
n-Butyl-poly(L-glutamic acid gamma-propargyl amide) sodium salt (10-20 mol% propargyl substitution, MW 49700Da) MOLECULAR WEIGHT: 49700 Da		PGA1207.0100	100 mg	€ 325,00
		PGA1207.0500	500 mg	€ 775,00
		PGA1207.1000	1 g	€ 1100,00
		PGA1207.5000	5 g	€ 3200,00

Find many more poly(amino acids) on www.iris-biotech.de



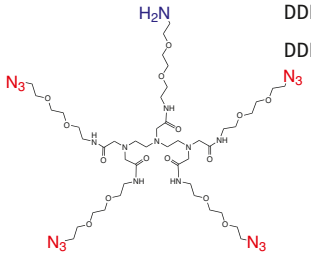
Prices are in EUR, net, exw Germany

e) PEG-based Dendrimers for Click Chemistry

	Article No.	Quantity	Price

DDN2070 PEG(2)-Pentrimer-G1-(NH_2+4xN_3)*4HCl

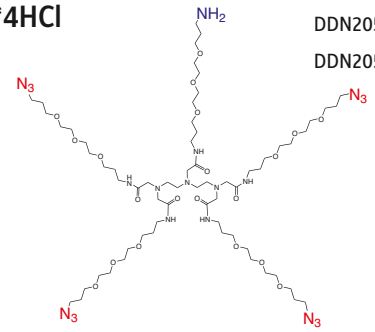
Pentavalent PEG(2) based Dendrimer-Generation-1 with one amino and four azido functions, tetrahydrochloride
MOLECULAR WEIGHT: 1148,28*145,81 g/mole



DDN2070.0250	250 mg	€	350,00
DDN2070.0001	1 g	€	990,00
DDN2070.0005	5 g	€	2275,00

DDN2050 PEG(3)-Pentrimer-G1-(NH_2+4xN_3)*4HCl

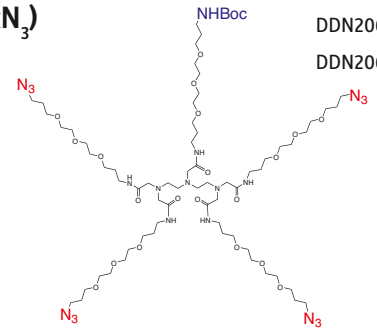
Pentavalent PEG(3) based Dendrimer-Generation-1 with one amino and four azido functions, tetrahydrochloride
MOLECULAR WEIGHT: 1508,81*145,81 g/mole



DDN2050.0250	250 mg	€	350,00
DDN2050.0001	1 g	€	990,00

DDN2060 PEG(3)-Pentrimer-G1-(Boc-NH+4xN_3)

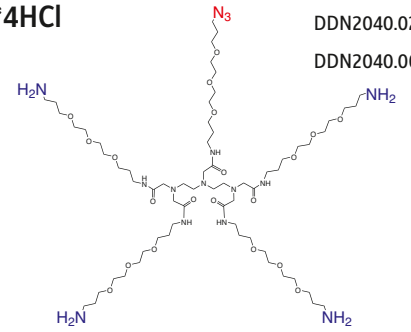
Pentavalent PEG based Dendrimer-Generation-1 with one t-butyloxycarbonylamino and four azido functions
MOLECULAR WEIGHT: 1608,92 g/mole



DDN2060.0250	250 mg	€	350,00
DDN2060.0001	1 g	€	990,00

DDN2040 PEG(3)-Pentrimer-G1-(N_3+4xNH_2)*4HCl

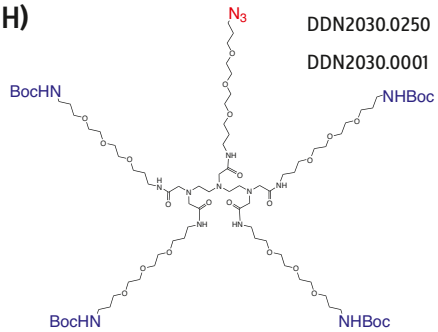
Pentavalent PEG based Dendrimer-Generation-1 with one azido and four amino functions, tetrahydrochloride
MOLECULAR WEIGHT: 1430,81*145,1 g/mole



DDN2040.0250	250 mg	€	325,00
DDN2040.0001	1 g	€	875,00

DDN2030 PEG(3)-Pentrimer-G1-(N_3+4xBoc-NH)

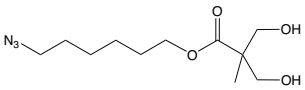
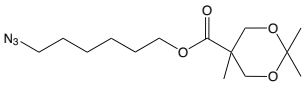
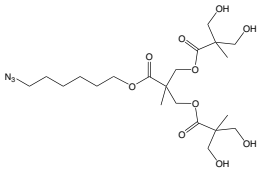
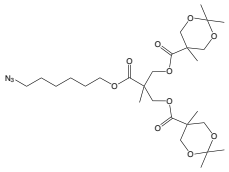
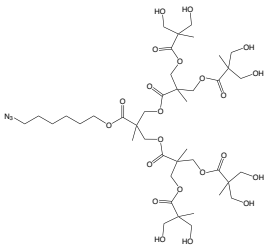
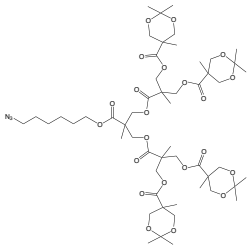
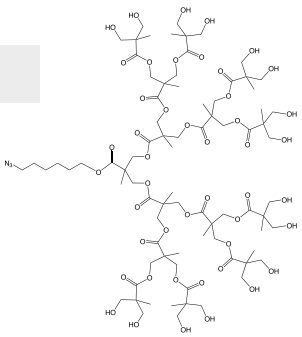
Pentavalent PEG based Dendrimer-Generation-1 with one azido and four t-butyloxycarbonylamino functions
MOLECULAR WEIGHT: 1831,28 g/mole



DDN2030.0250	250 mg	€	325,00
DDN2030.0001	1 g	€	875,00

Prices are in EUR, net, exw Germany

f) Azido Dendrons for Click Chemistry

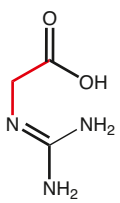
		Article No.	Quantity	Price
DDN1000	**Azido-Dendron-G1-(OH)$_2$**	DDN1000.0500	500 mg	€ 510,00
Azidohexyl-Dendron-Generation-1-dihydroxide, 6-Azidohexyl 3-hydroxy-2-(hydroxymethyl)-2-methylpropanoate MOLECULAR WEIGHT: 259,3 g/mole		DDN1000.1000	1 g	€ 790,00
DDN1050	**Azido-Dendron-G1-Acetonide**	DDN1050.0500	500 mg	€ 460,00
Azidohexyl-Dendron-Generation-1-acetonide, 6-Azidohexyl 2,2,5-trimethyl-1,3-dioxane-5-carboxylate MOLECULAR WEIGHT: 299,37 g/mole		DDN1050.1000	1 g	€ 700,00
DDN1010	**Azido-Dendron-G2-(OH)$_4$**	DDN1010.0500	500 mg	€ 630,00
Azidohexyl-Dendron-Generation-2-tetrahydroxide, 2-((6-azidohexyloxy)carbonyl)-2-methylpropane-1,3-diyl bis(3-hydroxy-2-(hydroxymethyl)-2-methylpropanoate) MOLECULAR WEIGHT: 491,53 g/mole		DDN1010.1000	1 g	€ 990,00
DDN1060	**Azido-Dendron-G2-(Acetonide)$_2$**	DDN1060.0500	500 mg	€ 560,00
Azidohexyl-Dendron-Generation-2-diacetonide, 2-((6-azidohexyloxy)carbonyl)-2-methylpropane-1,3-diyl bis(2,2,5-trimethyl-1,3-dioxane-5-carboxylate) MOLECULAR WEIGHT: 571,66 g/mole		DDN1060.1000	1 g	€ 870,00
DDN1020	**Azido-Dendron-G3-(OH)$_8$**	DDN1020.0500	500 mg	€ 800,00
Azidohexyl-Dendron-Generation-3-octahydroxide CAS-NO: 105928-88-9 net MOLECULAR WEIGHT: 955,99 g/mole		DDN1020.1000	1 g	€ 1290,00
DDN1070	**Azido-Dendron-G3-(Acetonide)$_4$**	DDN1070.0500	500 mg	€ 710,00
Azidohexyl-Dendron-Generation-3-tetraacetonide MOLECULAR WEIGHT: 1116,25 g/mole		DDN1070.1000	1 g	€ 1130,00
DDN1030	**Azido-Dendron-G4-(OH)$_{16}$**	DDN1030.0250	250 mg	€ 720,00
Azidohexyl-Dendron-Generation-4-hexadecihydroxide MOLECULAR WEIGHT: 1884,91 g/mole		DDN1030.0500	500 mg	€ 1100,00
		DDN1030.1000	1 g	€ 1810,00

Prices are in EUR, net, exw Germany

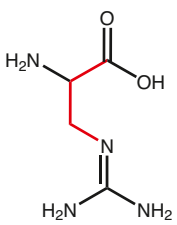
	Article No.	Quantity	Price
DDN1080 Azido-Dendron-G4-(Acetonide)$_8$ Azidohexyl-Dendron-Generation-4-octaacetonide MOLECULAR WEIGHT: 2205,43 g/mole	DDN1080.0250	250 mg	€ 640,00
	DDN1080.0500	500 mg	€ 970,00
	DDN1080.1000	1 g	€ 1580,00
DDN1040 Azido-Dendron-G5-(OH)$_{32}$ Azidohexyl-Dendron-Generation-5-dotriacontahydroxide MOLECULAR WEIGHT: 3742,76 g/mole	DDN1040.0250	250 mg	€ 1020,00
	DDN1040.0500	500 mg	€ 1580,00
	DDN1040.1000	1 g	€ 2650,00
DDN1090 Azido-Dendron-G5-(Acetonide)$_{16}$ Azidohexyl-Dendron-Generation-5-hexadeciacetonide MOLECULAR WEIGHT: 4383,78 g/mole	DDN1090.0250	250 mg	€ 900,00
	DDN1090.0500	500 mg	€ 1380,00
	DDN1090.1000	1 g	€ 2310,00

Amino acids analogues for peptidomimetics and medicinal chemistry.

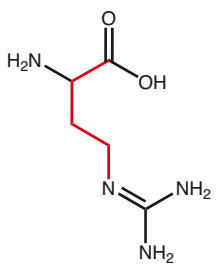
Amidino-Glycine
BAA6380



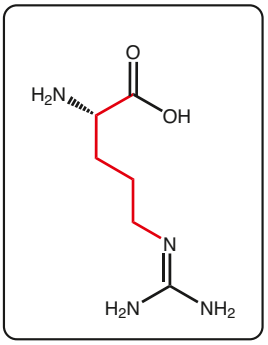
Amino-guanidino propionic acid
FAA1772



Amino-guanidino butyric acid
FAA6160



Arginine



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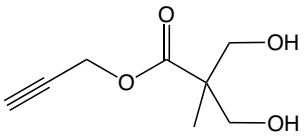
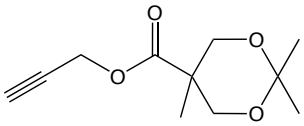
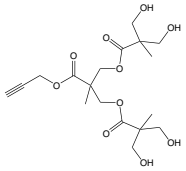
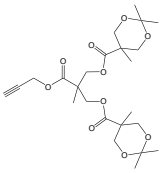
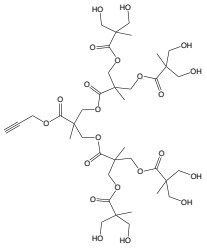
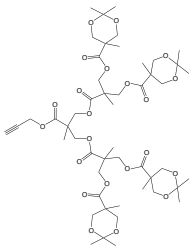
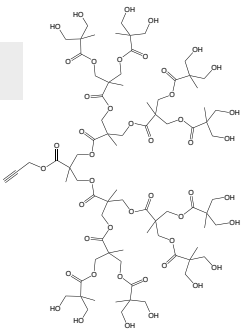
g) Alkyne Dendrons for Click Chemistry

		Article No.	Quantity	Price
DDN1100	**Alkynyl-Dendron-G1-$(OH)_2$**	DDN1100.0500	500 mg	€ 420,00
Propynyl-Dendron-Generation-1-dihydroxide, Prop-2-ynyl 3-hydroxy-2-(hydroxymethyl)-2-methylpropanoate MOLECULAR WEIGHT: 172,18 g/mole		DDN1100.1000	1 g	€ 620,00
DDN1150	**Alkynyl-Dendron-G1-Acetonide**	DDN1150.0500	500 mg	€ 390,00
Propynyl-Dendron-Generation-1-acetonide, Prop-2-ynyl 2,2,5-trimethyl-1,3-dioxane-5-carboxylate MOLECULAR WEIGHT: 212,24 g/mole		DDN1150.1000	1 g	€ 560,00
DDN1110	**Alkynyl-Dendron-G2-$(OH)_4$**	DDN1110.0500	500 mg	€ 500,00
Propynyl-Dendron-Generation-2-tetrahydroxide, 2-Methyl-2-((prop-2-ynyloxy)carbonyl)propane-1,3-diyl bis(3-hydroxy-2-(hydroxymethyl)-2-methylpropanoate) MOLECULAR WEIGHT: 404,41 g/mole		DDN1110.1000	1 g	€ 770,00
DDN1160	**Alkynyl-Dendron-G2-(Acetonide)$_2$**	DDN1160.0500	500 mg	€ 460,00
Propynyl-Dendron-Generation-2-diacetonide, 2-Methyl-2-((prop-2-ynyloxy)carbonyl)propane-1,3-diyl bis(2,2,5-trimethyl-1,3-dioxane-5-carboxylate) MOLECULAR WEIGHT: 484,54 g/mole		DDN1160.1000	1 g	€ 690,00
DDN1120	**Alkynyl-Dendron-G3-$(OH)_8$**	DDN1120.0500	500 mg	€ 630,00
Propynyl-Dendron-Generation-3-octahydroxide MOLECULAR WEIGHT: 868,87 g/mole		DDN1120.1000	1 g	€ 990,00
DDN1170	**Alkynyl-Dendron-G3-(Acetonide)$_4$**	DDN1170.0500	500 mg	€ 570,00
Propynyl-Dendron-Generation-3-tetraacetonide MOLECULAR WEIGHT: 1029,13 g/mole		DDN1170.1000	1 g	€ 890,00
DDN1130	**Alkynyl-Dendron-G4-$(OH)_{16}$**	DDN1130.0250	250 mg	€ 570,00
Propynyl-Dendron-Generation-4-hexadecihydroxide MOLECULAR WEIGHT: 1797,79 g/mole		DDN1130.0500	500 mg	€ 850,00
		DDN1130.1000	1 g	€ 1370,00

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	Article No.	Quantity	Price
DDN1180 Alkynyl-Dendron-G4-(Acetonide)$_8$ Propynyl-Dendron-Generation-4-octaacetonide MOLECULAR WEIGHT: 2118,3 g/mole	DDN1180.0250	250 mg	€ 520,00
	DDN1180.0500	500 mg	€ 760,00
	DDN1180.1000	1 g	€ 1230,00
DDN1140 Alkynyl-Dendron-G5-(OH)$_{32}$ Propynyl-Dendron-Generation-5-dotriacontahydroxide MOLECULAR WEIGHT: 3655,64 g/mole	DDN1140.0250	250 mg	€ 790,00
	DDN1140.0500	500 mg	€ 1200,00
	DDN1140.1000	1 g	€ 1990,00
DDN1190 Alkynyl-Dendron-G5-(Acetonide)$_{16}$ Propynyl-Dendron-Generation-5-hexadeciacetonide MOLECULAR WEIGHT: 4296,66 g/mole	DDN1190.0250	250 mg	€ 710,00
	DDN1190.0500	500 mg	€ 1080,00
	DDN1190.1000	1 g	€ 1770,00

Find many more Dendron building blocks in our brochure "Comprehensive Drug Delivery Survey":

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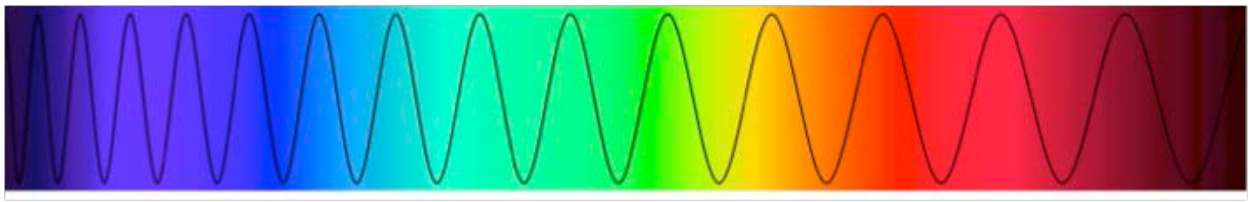
5. Dyes and Fluorescence Labels for Click Chemistry

Dyes and other labels which are non-native, modifying living systems, should be bioorthogonal, not alter the biological activity of the labelled component and be inert to physiological conditions. Among other tagging reactions the click reaction is highly valuable. It is superior to other labelling techniques because of the inertness of the conjugation triazol linkage and the selective and efficient reaction between the labelling target and the label. Therefore this technique has found successful applications beside the traditional active ester and maleinimide techniques in the field of labelling proteins and particularly DNA.

Find in the following section
dyes suitable for Click Chemistry.

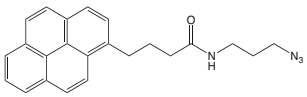
References:

- A stepwise Huisgen cycloaddition process: copper (I)-catalyzed regioselective ligation of azides and terminal alkynes; V.V. Rostovtsev, L.G. Green, K.B. Sharpless; *Angew. Chem. Int. Ed.* 2002; **41**: 2596-2599.
- Peptidotriazoles on solid phase: [1,2,3]-triazoles by regiospecific copper(I)-catalyzed 1,3-dipolar cycloaddition of terminal alkynes to azides; C.W. Tornøe, C. Christensen; M. Meldal; *J.Org.Chem.* 2002; **67**: 3057-3064.
- Surface-Modified Upconverting Microparticles and Nanoparticles for Use in Click Chemistries. H. S. Mader, M. Link, D. E. Achatz, K. Uhlmann, X. Li, O. S. Wolfbeis, *Chem. – Eur. J.* 2010; **16**: 5416-5424. DOI: 10.1002/chem.201000117.
- Probing the Activity of Matrix Metalloproteinase II Using a Sequentially Click-Labeled Silica Nanoparticle FRET Probe. D. E. Achatz, G. Mezö, P. Kele, O. S. Wolfbeis; *ChemBioChem* 2009; **10**: 2316-1320. DOI: 10.1002/cbic.200900261.
- Clickable Fluorophores for Biological Labeling – With or Without Copper. P. Kele, X. Li, M. Link, K. Nagy, A. Herner, K. Lörincz, S. Beni, O. S. Wolfbeis, Org. *Biomol. Chem.* 2009; **7**: 3486-3490. DOI: 10.1039/b907741c.
- Dual Labeling of Biomolecules by Click Chemistry: a Sequential Approach. P. Kele, G. Mezö, D. Achatz, O. S. Wolfbeis, *Angew. Chem.* 2009; **121**: 350-353; *Angew. Chem. Intl. Ed.* 2009; **48**: 344-347. DOI: 10.1002/ange.200804514.



	Article No.	Quantity	Price
DYB1190 Pyrene-Azide	DYB1190.0001	1 mg	€ 175,00
	DYB1190.0005	5 mg	€ 450,00

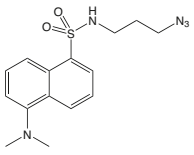
Pyrene-Azide N-(3-Azidopropyl)-4-(pyren-1-yl)butanamide
FORMULA: $C_{23}H_{22}N_4O$
MOLECULAR WEIGHT: 370,45 g/mole



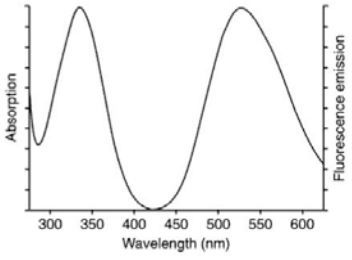
Spectral and other Properties:
- Absorption 340 nm
- Emission 376 nm
- Extinction coefficient 43.000 l/(mol*cm)
- soluble in DMSO, DMF, MeCN

	Article No.	Quantity	Price
DYB1180 Dansyl-Azide	DYB1180.0001	1 mg	€ 175,00
	DYB1180.0005	5 mg	€ 350,00

Dansyl-Azide N-(3-Azidopropyl)-5-(dimethylamino)naphthalene-1-sulfonamide
FORMULA: $C_{15}H_{19}N_5O_2S$
MOLECULAR WEIGHT: 333,41 g/mole



Spectral and other Properties:
- Absorption 340 nm
- Emission 520 nm
- Extinction coefficient 4.200 l/(mol*cm)
- soluble in DMSO, DMF, MeOH



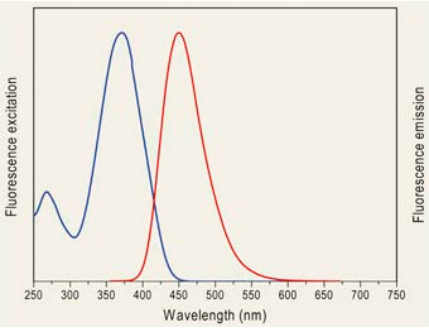
Prices are in EUR, net, exw Germany

Excitation UV-Violet (< 420nm)

	Article No.	Quantity	Price
DYB1050 Eterneon-350/455-Azide	DYB1050.0005	5 mg	€ 200,00
Eterneon-350/455-Azide MOLECULAR WEIGHT: 456,6 g/mole	DYB1050.0010	10 mg	€ 375,00

Spectral and other Properties:

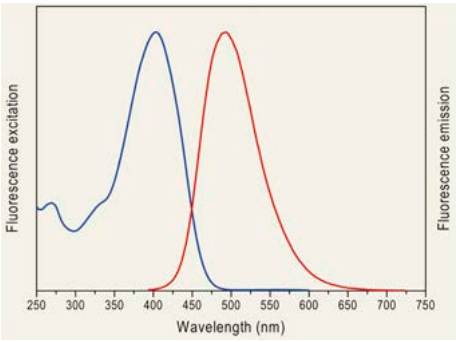
- Absorption 350 nm
- Emission 455 nm
- Extinction coefficient 27.300 l/(mol*cm)
- Quantum Yield 74%
- soluble in DMSO, DMF, DCM, Water/Tween, PBS



	Article No.	Quantity	Price
DYB1060 Eterneon-384/480-Azide	DYB1060.0005	5 mg	€ 200,00
Eterneon-384/480-Azide MOLECULAR WEIGHT: 538,73 g/mole	DYB1060.0010	10 mg	€ 375,00

Spectral and other Properties:

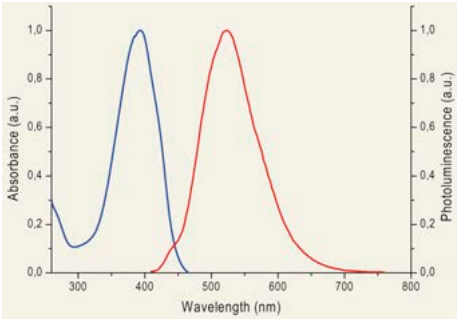
- Absorption 384 nm
- Emission 480 nm
- Extinction coefficient 18.000 l/(mol*cm)
- Quantum Yield 42%
- soluble in DMSO, DMF, DCM, Water/Tween, PBS



	Article No.	Quantity	Price
DYB1070 Eterneon-393/523-Azide	DYB1070.0005	5 mg	€ 200,00
Eterneon-393/523-Azide MOLECULAR WEIGHT: 582,78 g/mole	DYB1070.0010	10 mg	€ 375,00

Spectral and other Properties:

- Absorption 393 nm
- Emission 523 nm
- Extinction coefficient 27.680 l/(mol*cm)
- Quantum Yield 75%
- soluble in DMSO, DMF, DCM, Water/Tween, PBS



Prices are in EUR, net, exw Germany

Excitation UV-Violet (< 420nm)

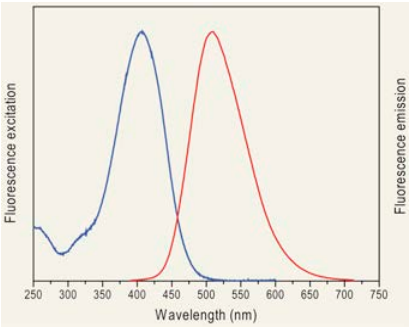
Article No.	Quantity	Price
DYB1080.0005	5 mg	€ 200,00
DYB1080.0010	10 mg	€ 375,00

DYB1080 Eterneon-394/507-Azide

Eterneon-394/507-Azide
MOLECULAR WEIGHT: 538,73 g/mole

Spectral and other Properties:

- Absorption 394 nm
- Emission 507 nm
- Extinction coefficient 30.000 l/(mol*cm)
- Quantum Yield 37%
- soluble in DMSO, DMF, DCM, Water/Tween, PBS

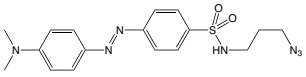


Excitation Blue-Green (420nm - 560nm)

Article No.	Quantity	Price
DYB1170.0001	1 mg	€ 175,00
DYB1170.0005	5 mg	€ 480,00

DYB1170 Dabsyl-Azide

Dabsyl-Azide N-(3-Azidopropyl)-4-((4-(dimethylamino)phenyl)diazenyl)benzenesulfonamide
FORMULA: $C_{17}H_{21}N_7O_2S$
MOLECULAR WEIGHT: 387,46 g/mole



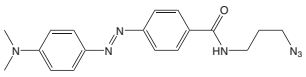
Spectral and other Properties:

- Absorption: 436 nm
- Soluble in DMSO, DMF, MeCN, AcOEt

Article No.	Quantity	Price
DYB1160.0001	1 mg	€ 175,00
DYB1160.0005	5 mg	€ 600,00
DYB1160.0100	100 mg	€ 2850,00

DYB1160 Dabcyl-Azide

Dabcyl-Azide N-(3-azidopropyl)-4-((4-(dimethylamino)phenyl) diazenyl)benzamide
FORMULA: $C_{18}H_{21}N_7O$
MOLECULAR WEIGHT: 351,41 g/mole



Spectral and other Properties:

- Absorption 478 nm
- Extinction coefficient 32.000 l/(mol*cm)
- soluble in DMSO, DMF, MeCN, AcOEt

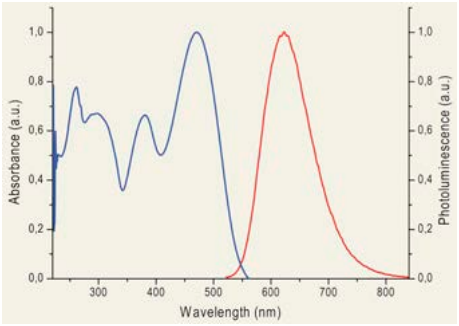
Prices are in EUR, net, exw Germany

Excitation Blue-Green (420nm - 560nm)

	Article No.	Quantity	Price
DYB1090 Eterneon-480/635-Azide	DYB1090.0005	5 mg	€ 225,00
Eterneon-480/635-Azide MOLECULAR WEIGHT: 629,79 g/mole	DYB1090.0010	10 mg	€ 425,00

Spectral and other Properties:

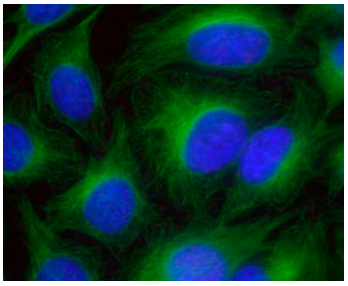
- Absorption 480 nm
- Emission 635 nm
- Extinction coefficient 29.900 l/(mol*cm)
- Quantum Yield 34%
- soluble in DMSO, DMF, DCM, Water/Tween, PBS

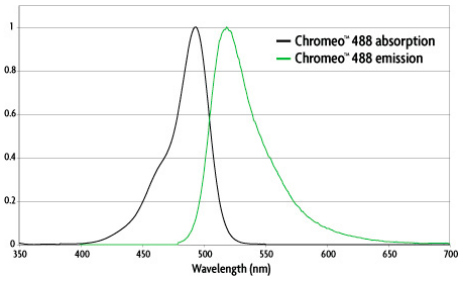


DYC1030 Chromeo 488-Azide	DYC1030.0005	5 mg	€ 975,00
Chromeo 488 Azide MOLECULAR WEIGHT: 599,75 g/mole			
DYC1040 Chromeo 488-Alkyne	DYC1040.0005	5 mg	€ 975,00
Chromeo 488 Alkyne MOLECULAR WEIGHT: 554,6 g/mole			

Spectral and other Properties:

- Absorption 488 nm
- Emission 517 nm
- Extinction coefficient 73.000 l/(mol*cm)
- Quantum Yield 38%





Prices are in EUR, net, exw Germany

Excitation Blue-Green (420nm - 560nm)

	Article No.	Quantity	Price

DYC2030 Chromeo 494-Azide

Chromeo 494 Azide
MOLECULAR WEIGHT: 597,62 g/mole

Article No.	Quantity	Price
DYC2030.0005	5 mg	€ 975,00

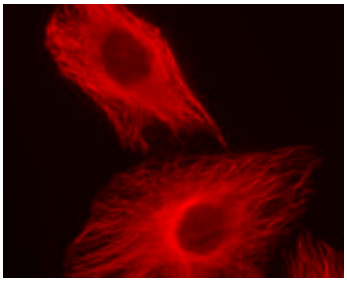
DYC2040 Chromeo 494-Alkyne

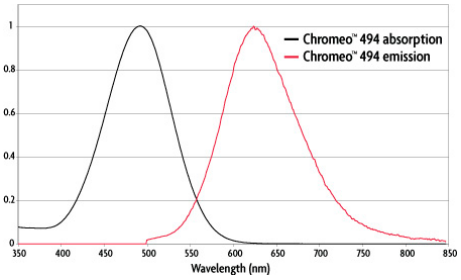
Chromeo 494 Alkyne
MOLECULAR WEIGHT: 472,6 g/mole

Article No.	Quantity	Price
DYC2040.0005	5 mg	€ 975,00

Spectral and other Properties:

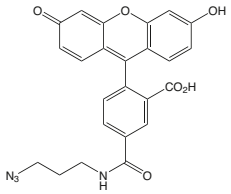
- Absorption 494 nm
- Emission 628 nm
- Extinction coefficient 55.000 L/(mol*cm)
- Quantum Yield 25%





DYB1010 5-Carboxyfluoresceine-Azide

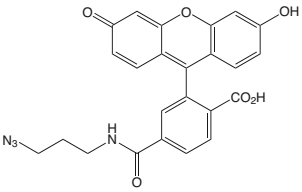
5-(3-Azidopropylcarbamoyl)-2-(6-hydroxy-3-oxo-3H-xanthen-9-yl) benzoic acid
FORMULA: $C_{24}H_{18}N_4O_6$
MOLECULAR WEIGHT: 458,43 g/mole



Article No.	Quantity	Price
DYB1010.0001	1 mg	€ 200,00
DYB1010.0005	5 mg	€ 600,00

DYB1000 6-Carboxyfluoresceine-Azide

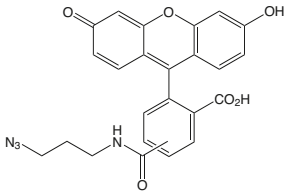
6-(3-Azidopropylcarbamoyl)-2-(6-hydroxy-3-oxo-3H-xanthen-9-yl) benzoic acid
FORMULA: $C_{24}H_{18}N_4O_6$
MOLECULAR WEIGHT: 458,43 g/mole



Article No.	Quantity	Price
DYB1000.0001	1 mg	€ 150,00
DYB1000.0010	10 mg	€ 200,00
DYB1000.0100	100 mg	€ 600,00

DYB1020 5/6-Carboxyfluoresceine-Azide

5/6-(3-Azidopropylcarbamoyl)-2-(6-hydroxy-3-oxo-3H-xanthen-9-yl) benzoic acid
FORMULA: $C_{24}H_{18}N_4O_6$
MOLECULAR WEIGHT: 458,43 g/mole



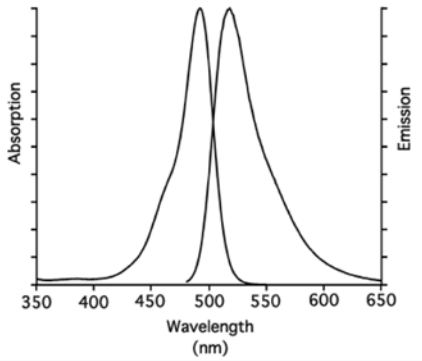
Article No.	Quantity	Price
DYB1020.0001	1 mg	€ 175,00
DYB1020.0005	5 mg	€ 450,00

Spectral and other Properties:

- Absorption 496 nm
- Emission 519 nm
- Soluble in: DMSO, DMF, MeOH

References:

- *Angew. Chem. Int. Ed.* 2008; **47**: 3442 –3444;
- *Angew. Chem. Int. Ed.* 2008; **47**: 8350-8358;
- *Tetrahedron Lett.* 2005; **46**: 1691-1695.



Prices are in EUR, net, exw Germany

Excitation Blue-Green (420nm - 560nm)

	Article No.	Quantity	Price

DYC3030 Chromeo 546-Azide

Chromeo 546 Azide
FORMULA: $C_{38}H_{54}N_6O_4P^*Br$
MOLECULAR WEIGHT: 689,95 g/mole

DYC3030.0005	5 mg	€	975,00

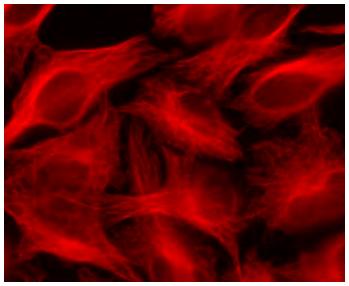
DYC3040 Chromeo 546-Alkyne

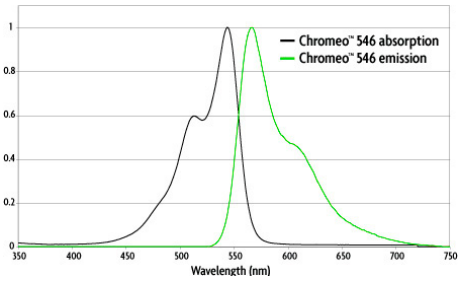
Chromeo 546 Alkyne
FORMULA: $C_{38}H_{51}N_3O_4P$
MOLECULAR WEIGHT: 644,8 g/mole

DYC3040.0005	5 mg	€	975,00

Spectral and other Properties:

- Absorption 545 nm
- Emission 561 nm
- Extinction coefficient 98.800 L/(mol*cm)
- Quantum Yield 10%





DYB1030 5-TAMRA-Azide

5-Carboxytetramethylrhodamine-Azide
FORMULA: $C_{28}H_{28}N_6O_4$
MOLECULAR WEIGHT: 512,56 g/mole

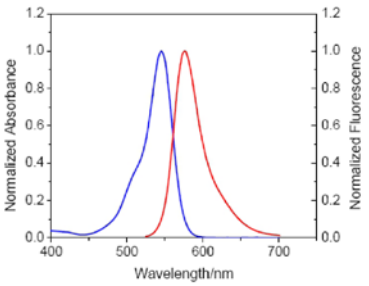
DYB1030.0001	1 mg	€	150,00
DYB1030.0010	10 mg	€	200,00
DYB1030.0100	100 mg	€	600,00

Spectral and other Properties:

- Absorption 546 nm
- Emission 579 nm
- Extinction coefficient 91.000 l/(mol*cm)
- soluble in DMSO, DMF, MeOH

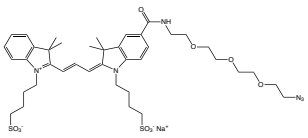
References:

- *Angew. Chem. Int. Ed.* 2008; **47**: 3442-3444.
- *Angew. Chem. Int. Ed.* 2008; **47**: 8350-8358.



DYM1250 MiDye550-Azide

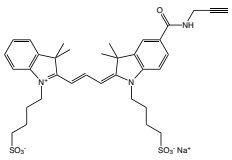
$MiDye_{550}$ amido(ethoxy(ethoxy(ethoxy(ethylazide))))
FORMULA: $C_{40}H_{55}N_6O_{12}S_2^*Na$
MOLECULAR WEIGHT: 867,02 g/mole



DYM1250.0005	5 mg	€	550,00
DYM1250.0010	10 mg	€	950,00

DYM1040 MiDye550 Propargylamide

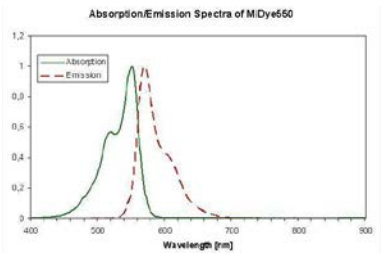
$MiDye_{550}$ Propargylamide
FORMULA: $C_{35}H_{42}N_3NaO_7S_2$
MOLECULAR WEIGHT: 703,84 g/mole



DYM1040.0005	5 mg	€	550,00
DYM1040.0010	10 mg	€	950,00

Spectral and other Properties:

- Absorption 550 nm
- Emission 580 nm
- Extinction coefficient 150.000 l/(mol*cm)
- Quantum Yield 15%



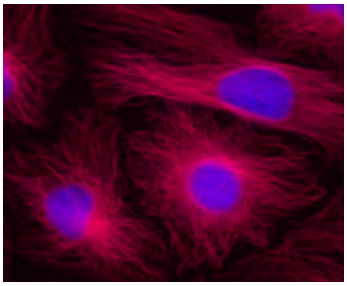
Prices are in EUR, net, exw Germany

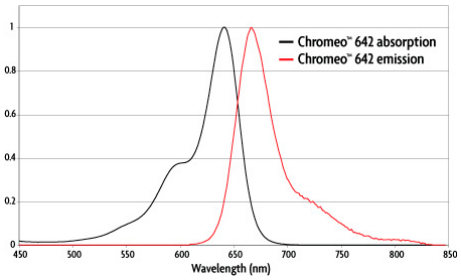
Excitation Red - NIR (> 630nm)

	Article No.	Quantity	Price
DYC4030 Chromeo 642-Azide	DYC4030.0005	5 mg	€ 975,00
Chromeo 642 Azide MOLECULAR WEIGHT: 767,83 g/mole			
DYC4040 Chromeo 642-Alkyne	DYC4040.0005	5 mg	€ 975,00
Chromeo 642 Alkyne MOLECULAR WEIGHT: 641,8 g/mole			

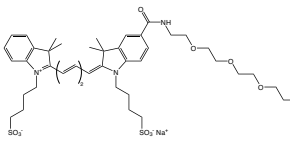
Spectral and other Properties:

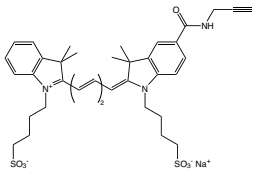
- Absorption 642 nm
- Emission 660 nm
- Extinction coefficient 180.000 L/(mol*cm)
- Quantum Yield 15%





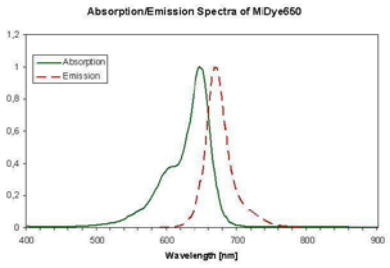
DYM1260 MiDye650-Azide	DYM1260.0005	5 mg	€ 550,00
$MiDye_{650}$ amido(ethoxy(ethoxy(ethoxy(ethylazide))))	DYM1260.0010	10 mg	€ 950,00
MOLECULAR WEIGHT: 893,06 g/mole			
DYM1140 MiDye650 Propargylamide	DYM1140.0005	5 mg	€ 550,00
$MiDye_{650}$ Propargylamide	DYM1140.0010	10 mg	€ 950,00
MOLECULAR WEIGHT: 729,88 g/mole			





Spectral and other Properties :

- Absorption 647 nm
- Emission 673 nm
- Extinction coefficient 255.000 l/(mol*cm)
- Quantum Yield 30%



Properties of the MiDye Chromophore System:

- Readily applicable to biolabelling, Click conjugation protocols and peptide synthesis
- Stable under buffer conditions (pH 4-8) and in solid phase peptide synthesis
- Broadly applied in cell and animal imaging, tested in FRET systems
- Available in larger quantities compared to e.g. Alexa, Cy-Dyes etc.
- Purities > 85%, supplied as freeze-dried solid powder

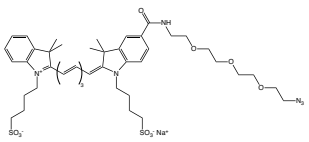
Prices are in EUR, net, exw Germany

Excitation Red - NIR (> 630nm)

	Article No.	Quantity	Price
DYM1270 MiDye750-Azide	DYM1270.0005	5 mg	€ 550,00
	DYM1270.0010	10 mg	€ 950,00
DYM1240 MiDye750 Propargylamide	DYM1240.0005	5 mg	€ 550,00
	DYM1240.0010	10 mg	€ 950,00

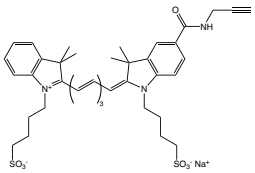
DYM1270 MiDye750-Azide

$MiDye_{750}$ amido(ethoxy(ethoxy(ethoxy(ethylazide))))
MOLECULAR WEIGHT: 919,09 g/mole



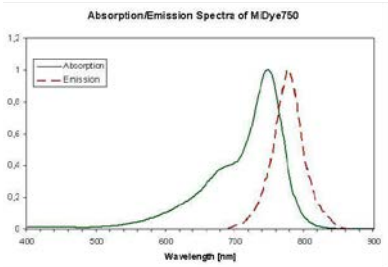
DYM1240 MiDye750 Propargylamide

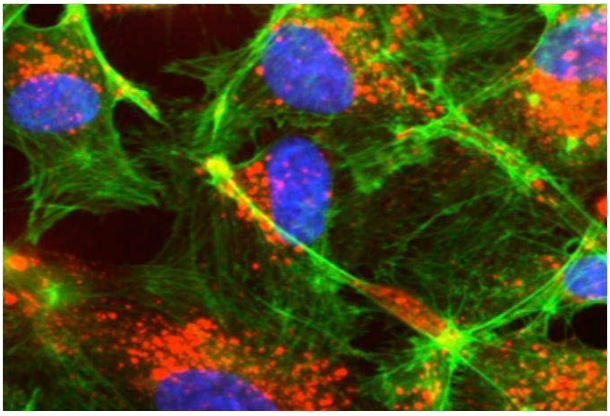
$MiDye_{750}$ Propargylamide
MOLECULAR WEIGHT: 755,92 g/mole



Spectral and other Properties :

- Absorption 747 nm
- Emission 782 nm
- Extinction coefficient 190.000 l/(mol*cm)
- Quantum Yield 9%





Properties of the MiDye Chromophore System:

- Readily applicable to biolabelling, Click conjugation protocols and peptide synthesis.
- Stable under buffer conditions (pH 4-8) and in solid phase peptide synthesis.
- Broadly applied in cell and animal imaging, tested in FRET systems.
- Available in larger quantities compared to e.g. Alexa, Cy-Dyes etc.
- Purities > 85%, supplied as freeze-dried solid powder.

Find more details about MiDye properties and applications in literature:

- Biocompatible Functionalized Polyglycerol Microgels with Cell Penetrating Properties; Adam L. Sisson, Dirk Steinhilber, Torsten Rossow, Pia Welker, Kai Licha, and Rainer Haag; *Angew. Chem. Int. Ed.* 2009; **48:** 7540-7545; DOI: 10.1002/anie.200901583.
- Synthesis, Characterization, and Biological Properties of Cyanine-Labeled Somatostatin Analogues as Receptor-Targeted Fluorescent Probes; Kai Licha, Carsten Hessenius, Andreas Becker, Peter Henklein, Michael Bauer, Stefan Wisniewski, Bertram Wiedenmann, and Wolfhard Semmler; *Bioconjugate Chem.* 2001; **12:** 44-50.
- Optical molecular imaging of lymph nodes using a targeted vascular contrast agent; Kai Licha, Niels Debus, Sonja Emig-Vollmer, Birte Hofmann, Michael Hasbach, Dietger Stibenz, Sabine Sydow, Michael Schirner, Bernd Ebert, Diethard Petzelt, Christoph Bührer, Wolfhard Semmler, Rudolf Tauber; *Journal of Biomedical Optics* 2005; **10(4):** 041205.
- A complete substitutional analysis of VIP for better tumor imaging properties; Sarah Bhargava, Kai Licha, Tobias Knaute, Bernd Ebert, Andreas Becker, Carsten Grötzinger, Carsten Hessenius, Bertram Wiedenmann, Jens Schneider-Mergener and Rudolf Volkmer-Engert, *J. Mol. Recognit.* 2002; **15:** 145-153; DOI:10.1002/jmr.565.
- Near-infrared fluorescence imaging with fluorescently labeled albumin: A novel method for non-invasive optical imaging of blood-brain barrier impairment after focal cerebral ischemia in mice; Jan Klohs, Jens Steinbrink, Riad Bourayou, Susanne Mueller, Ryan Cordell, Kai Licha, Michael Schirner, Ulrich Dirnagl, Ute Lindauer, AndreasWunder; *Journal of Neuroscience Methods* 2009; **180(1):** 126-32.
- Receptor-targeted optical imaging of tumors with near-infrared fluorescent ligands; Andreas Becker, Carsten Hessenius, Kai Licha, Bernd Ebert, Uwe Sukowski,Wolfhard Semmler, Bertram Wiedenmann, and Carsten Grötzinger; *nature biotechnology* 2001; **19:** 327-331.

Prices are in EUR, net, exw Germany

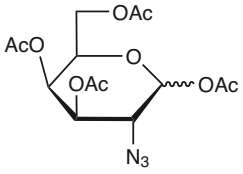
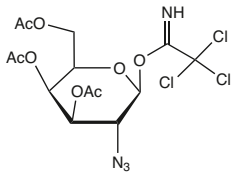
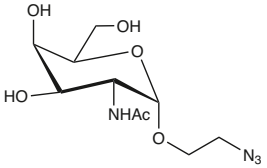
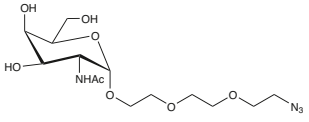
6. Carbohydrates for Click Chemistry

Protein and lipid glycosilation is a life-governing and omnipresent process. Glycoconjugates display a multitude of biological effects from protein folding and stabilization, energy storage, cell surface interaction through molecular recognition motifs for cell-cell communication, and structural support and protection. Defective metabolic pathways in pathological processes, inflammation and microbial virulence, neurodegenerative conditions or tumour metastasis are only a few key words indicating the many possible application fields. The smooth and selective reaction conditions of the Click reaction open so far impossible molecule design for drug development and vaccine development based on carbohydrate conjugation.

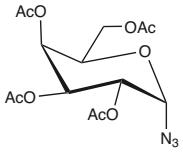
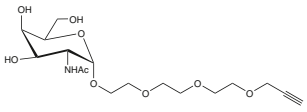
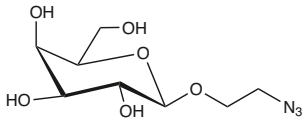
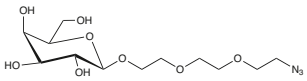
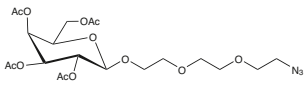
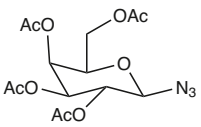
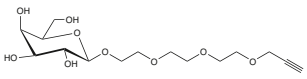
General References:

- Essentials of Glycobiology; A. Varki, R. Cummins, J. Esko, H. Freeze, G. Hart and J. Marth; Cold Spring Harbor Laboratory Press; Cold Spring Harbor 1999.
- Role of glycosylation in development; R. S. Haltiwanger and J. B. Lowe; *Annu Rev Biochem* 2004; **73**, 491-537.
- Glycosylation and the immune system; P. M. Rudd, T. Elliott, P. Cresswell, I. A. Wilson and R. A. Dwek; *Science* 2001; **291**, 2370-6.
- Glycosylation in cellular mechanisms of health and disease; K. Ohtsubo and J. D. Marth; *Cell* 2006; **126**, 855-67.
- The role of selectins in inflammation and disease; K. Ley; *Trends Mol Med* 2003; **9**, 263-8.
- Carbohydrate diversity: synthesis of glycoconjugates and complex carbohydrates; A. Holemann and P. H. Seeberger; *Curr Opin Biotechnol* 2004; **15**, 615-22.
- Post-translational modifications in the context of therapeutic proteins; G. Walsh and R. Jefferis; *Nat Biotechnol* 2006; **24**, 1241-52.
- Glycomics: a pathway to a class of new and improved therapeutics; Z. Shriver, S. Raguram and R. Sasisekharan; *Nat Rev Drug Discov* 2004; **3**, 863-73.
- The bittersweet promise of glycobiology; A. Dove; *Nat Biotechnol* 2001; **19**, 913-7.
- Carbohydrate and protein immobilization onto solid surfaces by sequential Diels-Alder and azide-alkyne cycloadditions; X. L. Sun, C. L. Stabler, C. S. Cazalis and E. L. Chaikof; *Bioconjug Chem* 2006; **17**, 52-7.
- Covalent display of oligosaccharide arrays in microtiter plates; M. C. Bryan, F. Fazio, H. K. Lee, C. Y. Huang, A. Chang, M. D. Best, D. A. Calarese, O. Blixt, J. C. Paulson, D. Burton, I. A. Wilson and C. H. Wong; *J Am Chem* Soc 2004; **126**, 8640-1.
- Multivalent, bifunctional dendrimers prepared by click chemistry; P. Wu, M. Malkoch, J. N. Hunt, R. Vestberg, E. Kaltgrad, M. G. Finn, V. V. Fokin, K. B. Sharpless and C. J. Hawker; *Chem Commun (Camb)* 2005, 5775-7.
- A chemoenzymatic approach to glycopeptide antibiotics; H. Lin and C. T. Walsh; *J Am Chem Soc* 2004; **126**, 13998-4003.

a) Galactose Derivatives

		Article No.	Quantity	Price
GBB1207 **D-Gal(N_3, Ac_3)-OAc** 2-Azido-2-deoxy-1,3,4,6-tetra-O-acetyl-D-galactopyranose CAS-NO: 84278-00-2 MOLECULAR WEIGHT: 373,32 g/mole		GBB1207.0002 GBB1207.0005 GBB1207.0010	2 g 5 g 10 g	€ 725,00 € 1200,00 € 2100,00
GBB1226 **beta-D-Gal(N_3, Ac_3)-TCAI** O-(2-Azido-3,4,6-tri-O-Ac-beta-D-Gal)-trichloroacetimidate MOLECULAR WEIGHT: 475,67 g/mole		GBB1226.0050 GBB1226.0100 GBB1226.0250	50 mg 100 mg 250 mg	€ 250,00 € 375,00 € 575,00
GBB1445 **alpha-GalNAc-N_3** 1-O-(2-Azidoethoxy)-2-acetamido-2deoxy-alpha-D-galactopyranoside MOLECULAR WEIGHT: 290,27 g/mole		GBB1445.0050 GBB1445.0100 GBB1445.0250 GBB1445.0500	50 mg 100 mg 250 mg 500 mg	€ 675,00 € 950,00 € 1900,00 € 2950,00
GBB1370 **alpha-GalNAc-TEG-N_3** 1-O-(2-(2-(2-Azidoethoxy)ethoxy)ethoxy)-2-acetamido-2deoxy-alpha-D-galactopyranoside MOLECULAR WEIGHT: 378,38 g/mole				please inquire!

Prices are in EUR, net, exw Germany

		Article No.	Quantity	Price
GBB1470 Azido-alpha-Gal(Ac_4) 2,3,4,6-Tetra-O-acetyl-alpha-D-galactopyranosyl azide CAS-NO: 94427-00-6 MOLECULAR WEIGHT: 373,32 g/mole		GBB1470.0002 GBB1470.0005	2 g 5 g	€ 325,00 € 625,00
GBB1375 alpha-GalNAc-TEG-Alkyne 1-O-(2-(2-(2-(Prop-2-ynyloxy)ethoxy)ethoxy)ethoxy)-2-acetamido-2-deoxy-alpha-D-galactopyranoside MOLECULAR WEIGHT: 391,41 g/mole		GBB1375.0100 GBB1375.0250 GBB1375.0500 GBB1375.1000	100 mg 250 mg 500 mg 1 g	€ 900,00 € 1850,00 € 3150,00 € 5250,00
GBB1430 beta-Gal-N_3 1-(2-Azidoethoxy)-beta-D-galactopyranose MOLECULAR WEIGHT: 249,22 g/mole		GBB1430.0100 GBB1430.0250 GBB1430.0500 GBB1430.1000	100 mg 250 mg 500 mg 1 g	€ 475,00 € 800,00 € 1200,00 € 1750,00
GBB1380 beta-Gal-TEG-N_3 1-O-(2-(2-(2-Azidoethoxy)ethoxy)ethoxy)-beta-D-galactopyranoside MOLECULAR WEIGHT: 337,33 g/mole				please inquire!
GBB1485 D-Gal(Ac_4)-beta-PEG(3)-N_3 2,3,4,6-Tetra-O-acetyl-beta-D-galactopyranosyl PEG(3)-azide MOLECULAR WEIGHT: 505,47 g/mole		GBB1485.0001 GBB1485.0002 GBB1485.0005	1 g 2 g 5 g	€ 275,00 € 375,00 € 725,00
GBB1460 Azido-beta-Gal(Ac_4) 2,3,4,6-Tetra-O-acetyl-beta-D-galactopyranosyl azide CAS-NO: 13992-26-2 MOLECULAR WEIGHT: 373,32 g/mole		GBB1460.0001 GBB1460.0002 GBB1460.0005	1 g 2 g 5 g	€ 225,00 € 350,00 € 675,00
GBB1385 beta-Gal-TEG-Alkyne 1-O-(2-(2-(2-(Prop-2-ynyloxy)ethoxy)ethoxy)ethoxy)-beta-D-galacto-pyranoside MOLECULAR WEIGHT: 350,36 g/mole				please inquire!

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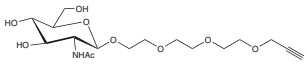
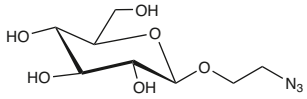
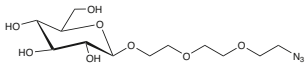
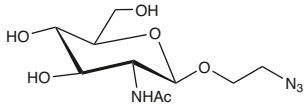
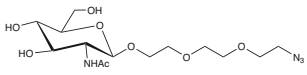
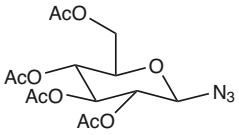
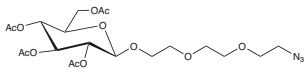
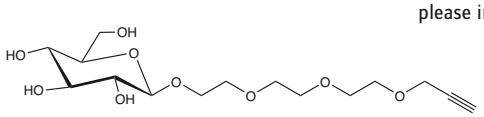
b) Glucose Derivatives

		Article No.	Quantity		Price
GBB1405	**beta-GlcNAc-TEG-Alkyne**	GBB1405.0250	250 mg	€	1850,00
1-O-(2-(2-(2-(Prop-2-ynyloxy)ethoxy)ethoxy)ethoxy)-2-acetamido-2-deoxy-beta-D-glucopyranoside MOLECULAR WEIGHT: 391,41 g/mole		GBB1405.0500	500 mg	€	3150,00
		GBB1405.1000	1 g	€	5250,00
GBB1435	**beta-Glc-N_3**	please inquire!			
1-(2-Azidoethoxy)-beta-D-glucopyranose MOLECULAR WEIGHT: 249,22 g/mole					
GBB1390	**beta-Glc-TEG-N_3**	please inquire!			
1-O-(2-(2-(2-Azidoethoxy)ethoxy)ethoxy)-beta-D-glucopyranoside MOLECULAR WEIGHT: 337,33 g/mole					
GBB1450	**beta-GlcNAc-N_3**	please inquire!			
1-(2-Azidoethoxy)-2-acetamido-2deoxy-beta-D-galactopyranose MOLECULAR WEIGHT: 290,27 g/mole					
GBB1400	**beta-GlcNAc-TEG-N_3**	GBB1400.0100	100 mg	€	1000,00
1-O-(2-(2-(2-Azidoethoxy)ethoxy)ethoxy)-2-acetamido-2deoxy-beta-D-glucopyranoside MOLECULAR WEIGHT: 378,73 g/mole		GBB1400.0250	250 mg	€	1900,00
		GBB1400.0500	500 mg	€	3250,00
GBB1465	**Azido-beta-Glc(Ac_4)**	GBB1465.0001	1 g	€	200,00
2,3,4,6-Tetra-O-acetyl-beta-D-glucopyranosyl azide CAS-NO: 13992-25-1 MOLECULAR WEIGHT: 373,32 g/mole		GBB1465.0002	2 g	€	275,00
		GBB1465.0005	5 g	€	500,00
		GBB1465.0025	25 g	€	1250,00
GBB1475	**D-Glc(Ac4)-beta-PEG(3)-N_3**	GBB1475.0001	1 g	€	275,00
2,3,4,6-Tetra-O-acetyl-beta-D-glucopyranosyl PEG(3)-azide MOLECULAR WEIGHT: 505,47 g/mole		GBB1475.0002	2 g	€	375,00
		GBB1475.0005	5 g	€	725,00
GBB1395	**beta-Glc-TEG-Alkyne**	please inquire!			
1-O-(2-(2-(2-(Prop-2-ynyloxy)ethoxy)ethoxy)ethoxy)-beta-D-glucopyranoside MOLECULAR WEIGHT: 350,36 g/mole					

Inquire for any other derivatives!

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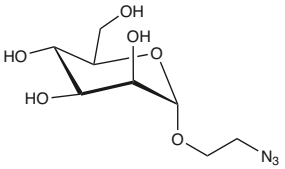
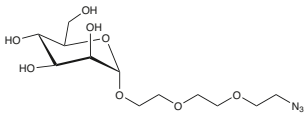
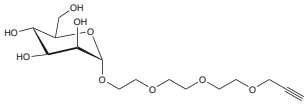
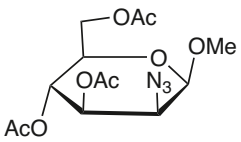
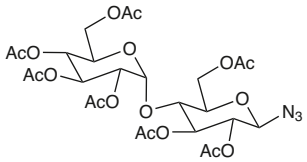
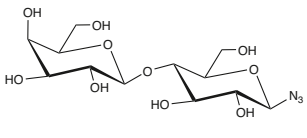
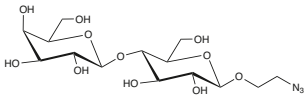
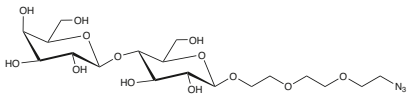
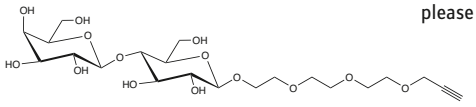
c) Mannose Derivatives

		Article No.	Quantity	Price
GBB1440	**alpha-Man-N_3** 1-(2-Azidoethoxy)-alpha-D-mannopyranose MOLECULAR WEIGHT: 249,22 g/mole		GBB1440.0100 GBB1440.0250 GBB1440.0500 GBB1440.1000	100 mg € 550,00 250 mg € 800,00 500 mg € 1400,00 1 g € 2100,00
GBB1420	**alpha-Man-TEG-N_3** 1-O-(2-(2-(2-Azidoethoxy)ethoxy)ethoxy)-alpha-D-mannopyranoside MOLECULAR WEIGHT: 337,33 g/mole		GBB1420.0100 GBB1420.0250	100 mg € 950,00 250 mg € 1575,00
GBB1425	**alpha-Man-TEG-Alkyne** 1-O-(2-(2-(2-(Prop-2-ynyloxy)ethoxy)ethoxy)ethoxy)-alpha-D-manno-pyranoside MOLECULAR WEIGHT: 350,36 g/mole		GBB1425.0100 GBB1425.0250 GBB1425.0500	100 mg € 750,00 250 mg € 1350,00 500 mg € 1900,00
GBB1222	**beta-D-Man(N_3, Ac_3)-OMe** Methyl 2-azido-2-deoxy-3,4,6-tri-O-acetyl-beta-D-mannose MOLECULAR WEIGHT: 345,34 g/mole		GBB1222.0050 GBB1222.0100 GBB1222.0250	50 mg € 175,00 100 mg € 250,00 250 mg € 400,00
GBB1490	**Mal(Ac_7)-beta-N_3** 2,3,4,6,2',3',6'-Hepta-O-acetyl-beta-maltosyl azide CAS-NO: 33012-49-6 MOLECULAR WEIGHT: 661,57 g/mole		GBB1490.0001 GBB1490.0002 GBB1490.0005	1 g € 225,00 2 g € 275,00 5 g € 490,00

d) Lactose Derivatives

GBB1480	**D-Lac-beta-N_3** 1-Azido-1-deoxy-beta-D-lactopyranoside CAS-NO: 69266-16-6 MOLECULAR WEIGHT: 367,31 g/mole		GBB1480.0100 GBB1480.0250 GBB1480.0500	100 mg € 225,00 250 mg € 325,00 500 mg € 490,00
GBB1455	**beta-Lac-EO-N_3** 1-(2-Azidoethoxy)-beta-D-lactose MOLECULAR WEIGHT: 411,36 g/mole		GBB1455.0100 GBB1455.0250 GBB1455.0500 GBB1455.1000	100 mg € 650,00 250 mg € 1100,00 500 mg € 1600,00 1 g € 2600,00
GBB1410	**beta-Lac-TEG-N_3** CAS-NO: MOLECULAR WEIGHT: 499,47 g/mole		please inquire!	
GBB1415	**beta-Lac-TEG-Alkyne** 1-O-(2-(2-(2-(Prop-2-ynyloxy)ethoxy)ethoxy)ethoxy)-beta-D-lactoside MOLECULAR WEIGHT: 512,5 g/mole		please inquire!	

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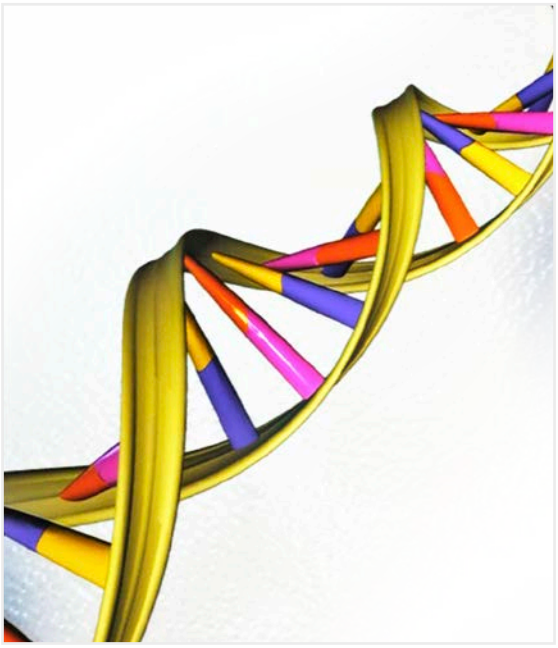
7. Click Chemistry in DNA Synthesis

a) Applications and Procedures in DNA Synthesis

Due to its unique bioorthogonality the Click reaction is very useful also in any oligonucleotide synthesis. Simple or no workup and purification of the product are further advantages. However, the use of this method for DNA modification has been somewhat delayed by the fact that copper ions damage DNA, typically causing strand breaks [1]. As these problems have now been overcome by the use of copper(I)-stabilizing ligands (e.g. tris(benzyltriazolylmethyl)amine, TBTA [2]), 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 [3-5].

A broad field of applications opens by using DNA Click components:



- DNA and RNA labelling: incorporation of alkyne-phosphoramidites followed by labelling with azido markers [8];
- PCR assays, PCR primers and labelling of large fragments with alkyne triphosphates in nucleotide mixtures; labelling PCR-fragments with azido markers [8];
- oligonucleotides as multi-labelled primers for pre- or post-synthetic modification;
- FISH probes and FISH experiments: with alkyne-modified oligonucleotides and labelling with azido marker (pre- or post-hybridization);
- PEGylation of DNA and RNA;
- Microarrays with phosphoramidites, triphosphates or oligonucleotides to set up microarrays;
- Nanoparticles, Bioconjugation.

References

- [1] Oxidative Nucleobase Modifications Leading to Strand Scission; C. J. Burrows and J. G. Muller; *Chem Rev* 1998; **98**: 1109-1152.
- [2] Polytriazoles as copper(I)-stabilizing ligands in catalysis; T. R. Chan, R. Hilgraf, K. B. Sharpless and V. V. Fokin; *Org Lett* 2004; **6**: 2853-5.
- [3] Click chemistry as a reliable method for the high-density post-synthetic functionalization of alkyne-modified DNA; J. Gierlich, G. A. Burley, P. M. Gramlich, D. M. Hammond and T. Carell; *Org Lett* 2006; **8**: 3639-42.
- [4] DNA containing side chains with terminal triple bonds: Base-pair stability and functionalization of alkynylated pyrimidines and 7-deazapurines; F. Seela and V. R. Sirivolu; *Chem Biodivers* 2006; **3**: 509-14.
- [5] Click-click-click: single to triple modification of DNA; P. M. Gramlich, S. Warncke, J. Gierlich and T. Carell; *Angew Chem Int Ed Engl* 2008; **47**: 3442-4.
- [6] New labelling strategies for the sensitive detection of analytes; Patent WO2006/117161
- [7] Nucleosides and Oligonucleotides with Diynyl Side Chains: Base Pairing and Functionalization of 2'-Deoxyuridine Derivatives by the CuI-Catalyzed Alkyne-Azide "Click'' Cycloaddition; F. Seela, V. R. Sirivolu, *Helv. Chim. Acta*, **2007**: 90, 535.
- [8] Synthesis of highly modified DNA by a combination of PCR with alkyne-bearing triphosphates and click chemistry; J. Gierlich, K. Gutsmiedl, P. M. Gramlich, A. Schmidt, G. A. Burley and T. Carell; *Chemistry* 2007; **13**: 9486-94.

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Published Examples of Click Reactions in DNA Synthesis:

These protocols may be used as a starting point with further optimization.

Preparation of the "Click Solution":

- The "click solution" (0.1 M CuBr / 0.1 M TBTA 1:2 in DMSO/t-BuOH 3:1) must always be freshly prepared prior to use!
- Dissolve 1 mg CuBr in 70 µl DMSO/t-BuOH 3:1 to obtain a 0.1 M solution. This solution must be freshly prepared and cannot be stored.
- Dissolve 54 mg TBTA in 1 ml DMSO/t-BuOH 3:1 for a 0.1 M solution. This solution can be stored at -20 °C.
- Add 1 volume of the 0.1 M CuBr solution quickly to 2 volumes of the 0.1 M TBTA solution to obtain "click solution", ready to use.

Click Procedure for Short DNA:

Procedure using CuBr: To 5 µl of a 2 mM DNA solution (10 nmol) in water, 5 µl of an azide solution (10 mM, 50 nmol, 5 eq.), 3 µl of a freshly prepared solution containing 0.1 M CuBr and 0.1 M TBTA ligand in a 1:2 ratio in 3:1 DMSO/t-BuOH is added. The mixture is thoroughly mixed and shaken at 25 °C for 3-4 h. The reaction is subsequently diluted with 0.3 M NaOAc (100 µl) and the DNA is precipitated using 1 ml cold EtOH. The supernatant is then removed and the residue is washed twice with 1 ml cold EtOH. The washed residue is redissolved in pure water (20 µl) and can be used without further purification.

Considerations for the CuBr method:

The labelling reaction works more efficiently with concentrated solutions of alkynes (oligo) and azides (label). The best way to carry out the click reaction is to mix the oligo and the azide-label in a minimal amount of solvent (Alkyne / Azide ratio: from 1:2 to 1:10 for high density labelling reactions, e.g. 10 alkynes in a row). The click reaction is normally accelerated by elevated temperature and can be ready in less than 30 min when the reaction temperature is around 40 - 45 °C. The reaction time depends on:

a) concentration of azide and oligo in the solution;

b) reaction temperature;

c) stirring and/or mixing of the solution.

The work-up of the reaction is normally carried out by precipitation of the labelled oligo.

Click Procedure Using Alternative Cu(I) Sources:

Procedure using TCEP: To 25 µl of a 0.5 mM DNA solution (12.5 nmol) in water, 6.25 µl of an azide solution (0.1 N, 625 nmol) and 10 µl of a solution containing Cu(II)-salt (CuSO4) and TBTA ligand in a 1:2 ratio in 4:3:1 water/DMSO/t-BuOH is added (0.05 N, 250 nmol). The mixture is vortexed and 5 µl of a freshly prepared tris-(2-carboxyethyl)-phosphine (TCEP) solution in water is added (0.1 N, 500 nmol). The solution is shaken at 15 °C over night and subsequently diluted with water (200 µl) and used for gel electrophoresis without further purification. Instead of TCEP, also sodium ascorbate can be used.

Click Procedure for a 300 bp PCR Product:

To 10 µl DNA solution (1-4 pmol DNA, 10 mM Tris), 10 µl fluorescein azide solution (5 mM, diluted with 10 mM Tris with 5 % t-BuOH from a stock of 0.1 N in DMSO) and 10 µl precomplexed Cu(I) is added (10 mM; 1 mg CuBr (99.99%) dissolved in 700 µl of 10 mM TBTA ligand in t-BuOH/DMSO 1:3). The sample is shaken at 37 °C for 2 h. Then formamide buffer is added and the samples are analyzed using a 5 % PAGE gel. Control experiments show that the reaction is completed in less than 30 min.

Additional References related to Click Chemistry and DNA Synthesis:

- A Programmable DNA-Based Molecular Valve for Colloidal Mesoporous Silica. A. Schlossbauer, S. Warncke, P. M. E. Gramlich, J. Kecht, A. Manetto, T. Carell, T. Bein, *Angew. Chem. Int. Ed.* 2010; **49:** 4734-4737.
- Click Chemistry with DNA. A. H. El-Sagheer, T. Brown, *Chem. Soc. Rev.* 2010; **39:** 1388-1405.
- Click Chemistry as a Reliable Method for the High-Density Post-synthetic Functionalization of Alkyne-Modified DNA. J. Gierlich, G. A. Burley, P. M. E. Gramlich, D. M. Hammond, T. Carell, *Org. Lett.* 2006; **8:** 3639-3642.
- Direct DNA Metallization. G. A. Burley, J. Gierlich, M. R. Mofid, S. T. H. Nir, Y. Eichen, T. Carell, *J. Am. Chem. Soc.* 2006; **128:** 1398-1399.
- DNA Containing Side Chains with Terminal Triple Bonds: Base Pair Stability and Functionalization of Alkynylated Pyrimidines and 7-Deazapurines. F. Seela, V. Ramana Sirivolu, *Chemistry & Biodiversity* 2006; **3:** 509.
- Formation of bimetallic Ag-Au nanowires by metallization of artificial DNA duplexes. M. Fischler, U. Simon, H. Nir, Y. Eichen, G. A. Burley, J. Gierlich, P. M. E. Gramlich, T. Carell, *Small* 2007; **3:** 1049-55.
- Nucleosides and Oligonucleotides with Diynyl Side Chains: The Huisgen-Sharpless Cycloaddition "Click reaction" Performed on DNA and their Constituents. F. Seela, V. R. Sirivolu, Nucleosides, *Nucleotides and Nucleic Acids* 2007; **26:** 597.

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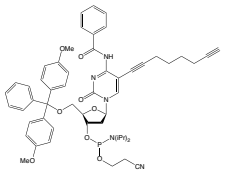
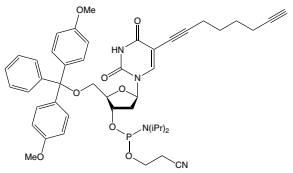
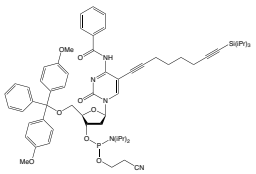
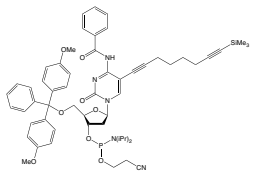
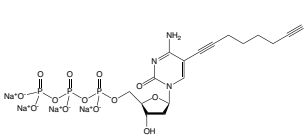
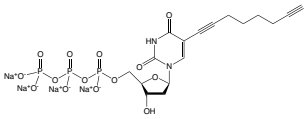
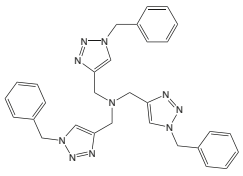
- DNA Photography: An Ultrasensitive DNA-Detection Method Based on Photographic Techniques. D. M. Hammond, A. Manetto, J. Gierlich, V. A. Azov, P. M. E. Gramlich, G. A. Burley, M. Maul, T. Carell, *Angew. Chem. Int. Ed.* 2007; **46:** 4184-4187.
- Pronounced Effect of DNA Hybridization on Click Reaction Efficiency. C. T. Wirges, P. M. E. Gramlich, K. Gutsmiedl, J. Gierlich, G. A. Burley, T. Carell, *QSAR Comb. Sci.* 2007; **26:** 1159-1164.
- Postsynthetic DNA Modification through the Copper-Catalyzed Azide-Alkyne Cycloaddition Reaction. P. M. E. Gramlich, C. T. Wirges, A. Manetto, T. Carell, *Angew. Chem. Int. Ed.* 2008; **47:** 8350-8358.
- Click Chemistry and Oligonucleotides: How a simple reaction can do so much. F. Morvan, A. Meyer, G. Pourceau, S. Vidal, Y. Chevolot, E. Souteyrand, J.-J. Vasseur *Nucleic Acids Symposium Series* 2008; **52:** 47-48.

b) Available DNA Reagents for Click Chemistry

		Article No.	Quantity	Price
DNA2000	**C8-Alkyne-dC-CEP** 5'-Dimethoxytrityl-N-benzoyl-[5-(octa-1,7-diynyl)-2'-deoxyCytidine]-3'-[(2-cyanoethyl)-(N,N-diisopropyl)]-phosphoramidite MOLECULAR WEIGHT: 938,06 g/mole		DNA2000.0250 DNA2000.1000	250 mg € 550,00 1 g € 2200,00
DNA2010	**C8-Alkyne-dU-CEP** 5'-Dimethoxytrityl-[5-(octa-1,7-diynyl)-2'-deoxyUridine]-3'-[(2-cyanoethyl)-(N,N-diisopropyl)]-phosphoramidite MOLECULAR WEIGHT: 834,94 g/mole		DNA2010.0250 DNA2010.1000	250 mg € 450,00 1 g € 1750,00
DNA2020	**C8-TIPS-dC-CEP** 5'-Dimethoxytrityl-N-benzoyl-{5-[8-(triisopropylsilyl)octa-1,7-diynyl]-2'-deoxyCytidine}-3'-[(2-cyanoethyl)-(N,N-diisopropyl)]-phosphoramidite MOLECULAR WEIGHT: 1094, g/mole		DNA2020.0250 DNA2020.1000	250 mg € 650,00 1 g € 2500,00
DNA2030	**C8-TMS-dC-CEP** 5'-Dimethoxytrityl-N-benzoyl-{5-[8-(trimethylsilyl)octa-1,7-diynyl]-2'-deoxyCytidine}-3'-[(2-cyanoethyl)-(N,N-diisopropyl)]-phosphoramidite MOLECULAR WEIGHT: 1010,24 g/mole		DNA2030.0250 DNA2030.1000	250 mg € 650,00 1 g € 2500,00
DNA2050	**C8-Alkyne-dCTP** 5-(octa-1,7-diynyl)-2'-deoxyCytidine triphosphate MOLECULAR WEIGHT: 659,23 g/mole		DNA2050.0005 DNA2050.0025 DNA2050.0050	0,5 µmol € 150,00 2,5 µmol € 400,00 5,0 µmol € 600,00
DNA2040	**C8-Alkyne-dUTP** 5-(octa-1,7-diynyl)-2'-deoxyUridine triphosphate MOLECULAR WEIGHT: 660,22 g/mole		DNA2040.0005 DNA2040.0025 DNA2040.0050	0,5 µmol € 150,00 2,5 µmol € 400,00 5,0 µmol € 600,00

Catalyst and Auxiliary Reagent

RL-2010	**TBTA** Tris[(1-benzyl-1H-1,2,3-triazol-4-yl)methyl]amine CAS-NO: 510758-28-8 MOLECULAR WEIGHT: 530,63 g/mole		RL-2010.0250 RL-2010.1000 RL-2010.5000	250 mg € 175,00 1 g € 475,00 5 g € 1875,00

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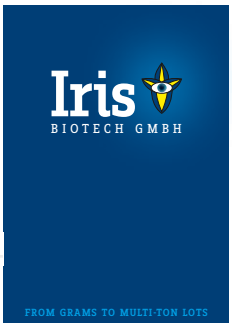

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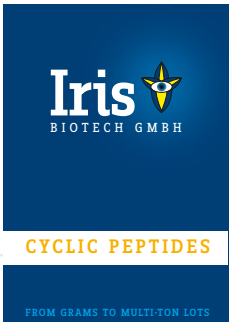

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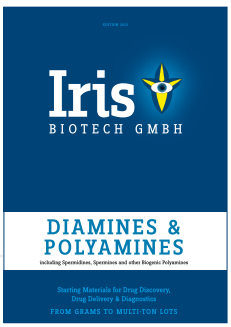

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