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12 Tools of Click Chemistry

Tools for creating modular system of interconnected components

FOR HANDLE INTRODUCTION (LINKERS) | HANDLE INSTALLATION | REACTION SUPPORT AND ACCELERATION | DETECTION AND FUNCTIONAL TAGGING | SPECIALIZED AND MULTIFUNCTIONAL LINKERS | TARGET ISOLATION AND DOWNSTREAM ENRICHMENT

Highly Chemoselective, Rapid And Biocompatible Labeling

Click Chemistry offers a powerful suite of advantages that make it an essential tool for bioconjugation reactions. Its high specificity enables precise reactions even within complex biological environments, while rapid reaction kinetics ensure fast and efficient conversions. The approach delivers high yield and purity, producing near-quantitative results with minimal by-products. Designed for mild, biocompatible conditions, Click Chemistry is well-suited for use in biological systems without compromising their integrity. Its modular design allows the integration of diverse functional groups to meet varied application needs. Furthermore, it supports scalable reactions, delivering reproducible outcomes from small-scale experiments to large-scale preparations. Finally, Click Chemistry offers excellent solubility, functioning effectively in both aqueous and organic solvents to accommodate a wide range of experimental conditions.

Toolbox | 12 Tools for Click Chemistry

The Click Chemistry Toolbox by Vector Labs offers a comprehensive suite of reagents for handle introduction, handle installation, reaction acceleration, detection and tagging, multifunctional linker deployment, and target isolation for downstream enrichment.

- **Azides** (azide, picolyl azide, azide plus)
- **Terminal Alkynes**
- **Metabolic Labeling**
- **Affinity Labels** (Biotin, Desthiobiotin, Dig)
- **Strained Alkynes** (DBCO)
- **Tetrazines** (H-Tz, Me-Tz)
- **Reagents and Kits**
- **Bioorthogonal Labels** (Crosslinkers)
- **Strained Alkenes** (TCO)
- **Enzymatic Labeling**
- **Fluorescent Labels**
- **Immobilization and Capture** (Enrichment)

Click Chemistry workflows begin by introducing reactive groups into biomolecules using standard crosslinkers. For more sophisticated applications, reactive handles can be installed directly through enzymatic or metabolic labeling methods, enabling precise bioorthogonal tagging. Reaction speed, specificity, and efficiency are enhanced with specialized reagents or catalysts, often under biologically compatible conditions. Once labeled, molecules can be tagged with fluorescent dyes, radiolabels, or affinity markers for visualization, tracking, or downstream analysis. Multifunctional linkers allow for advanced strategies such as dual labeling, controlled release, or complex conjugation. Finally, click-labeled targets can be captured, isolated, and enriched to support purification and in-depth study.

Handle Introduction (Linkers)

- Alkyl and Sulfonated Crosslinkers
- dPEG Crosslinkers

Azides
(azide, picolyl azide, azide plus)

Azides are reactive groups commonly used in Click Chemistry for their ability to undergo cycloaddition reactions with terminal alkynes, forming stable triazole linkages. Variants like picolyl azide and Azide Plus offer versatility without accelerants (ligands), improving solubility and reactivity in diverse environments, making them ideal for conjugation in biological and chemical applications.

Terminal Alkynes

Terminal alkynes are essential reactants in Click Chemistry, reacting with azides to form triazoles via the CuAAC mechanism. Their simplicity and high reactivity make them reliable tools for bioconjugation, polymer synthesis, and drug development, providing efficient and stable linkages.

Tetrazines
(H-Tz, Me-Tz)

Tetrazines are highly reactive groups that undergo rapid and efficient ligation with strained alkenes (like TCO) in the Tetrazine-TCO ligation. Ultra-fast kinetics and copper-free reactivity make them ideal for applications requiring swift, bioorthogonal reactions, such as in vivo labeling and tracking.

Strained Alkynes (DBCO)

Strained alkenes like trans-cyclooctene (TCO) are used in Click Chemistry for their ability to react efficiently with tetrazines in bioorthogonal ligation reactions. TCO is especially useful for applications that require rapid reaction times and minimal interference with biological systems, making it a powerful tool for real-time molecular imaging and drug delivery.

Strained Alkenes (TCO)

Strained alkenes , like dibenzocyclooctyne (DBCO), offer enhanced reactivity in the SPAAC reaction with azides, without the need for copper catalysts. This makes them particularly useful in biological contexts where copper toxicity is a concern, ensuring high bio-compatibility while maintaining efficiency.

Handle Installation

Go beyond conventional handle introduction by incorporating reactive moieties covalently into biomolecules through enzymatic or metabolic labeling—offering a more sophisticated method to prepare targets for bioorthogonal click reactions.

Metabolic Labeling

- Nucleosides
- Saccharides
- Non-Canonical Amino Acids
- Lipids

Metabolic labeling involves incorporating bioorthogonal reactive groups into proteins, cells, organisms, proteins, and nucleic acids, allowing for the selective labeling of newly synthesized biomolecules. This technique is essential for studying cellular processes like protein synthesis, lipid metabolism, and gene expression in real-time.

Enzymatic Labeling

- Sortase Substrates (Gly-Gly-Gly)
- Transglutaminase Substrates (Amine)

Enzymatic labeling utilizes enzyme-catalyzed reactions to incorporate Click Chemistry handles (such as azides or alkynes) into biomolecules. This provides a highly specific and efficient method for labeling proteins, lipids, and other macromolecules for tracking, enrichment, site-specific payload conjugations, or functional studies.

Reaction Support and Acceleration

Use reagents or catalysts to enhance the speed, specificity, and efficiency of click reactions—often under biological conditions.

Reagents and Kits

- Click Chemistry Reaction Buffer Kits
- CuAAC Accelerating Ligands
- Click-&-Go Labeling Kits

Reagents and kits are commercially available tools that simplify the process of conducting Click Chemistry reactions, providing pre-optimized solutions for efficient conjugation, labeling, and purification. These ready-to-use systems save time and increase reproducibility, making Click Chemistry more accessible for researchers working across a wide range of scientific disciplines.

Detection and Functional Tagging

Attach fluorescent dyes, radiolabels, affinity tags, or other markers to click-enabled molecules for visualization, tracking, or downstream analysis.

Fluorescent Labels

- Azides (CuAAC and SPAAC)
- Terminal Alkynes (CuAAC)
- Strained Alkynes (SPAAC)
- Tetrazines (IEDDA)
- Strained Alkenes (IEDDA)

Affinity Labels (Biotin, Desthiobiotin, Dig)

- Azides (CuAAC and SPAAC)
- Terminal Alkynes (CuAAC)
- Strained Alkynes (SPAAC)
- Tetrazines (IEDDA)
- Strained Alkenes (IEDDA)
- Cleavable Biotin Probes
- Trifunctional Biotin Probes

Fluorescent labels are commonly used in Click Chemistry for tagging biomolecules, enabling their detection and tracking in biological systems. These labels provide sensitive and non-invasive methods for visualizing molecular interactions, protein localization, and cellular dynamics in real time.

Affinity labels like biotin, desthiobiotin, and digoxigenin are used in Click Chemistry to target specific biomolecules for isolation or detection through their strong binding properties. These labels are crucial for enriching specific targets, such as proteins or nucleic acids, in complex biological samples for subsequent analysis or purification.

Specialized and Multifunctional Linkers

Bioorthogonal Labels (Crosslinkers)

- Azides (CuAAC and SPAAC)
- Terminal Alkynes (CuAAC)
- Strained Alkynes (SPAAC)
- Tetrazines (IEDDA)
- Strained Alkenes (IEDDA)

Apply linkers that incorporate multiple reactive groups or functionalities to enable dual labeling, controlled release, or complex conjugation strategies.

Bioorthogonal labels are designed to undergo reactions in living systems without interfering with native biological processes. These crosslinkers, often used in Click Chemistry, allow for the selective labeling or modification of biomolecules in living organisms, enabling precise control over cellular interactions and molecular pathways.

Target Isolation and Downstream Enrichment

Immobilization and Capture (Enrichment)

- Functionalized Magnetic Beads
- Functionalized Agarose
- Streptavidin-Based Capture
- Click-&-Go Capture (Streptavidin-Free)
- Cleavable Click-&-Go Capture (Streptavidin-Free)

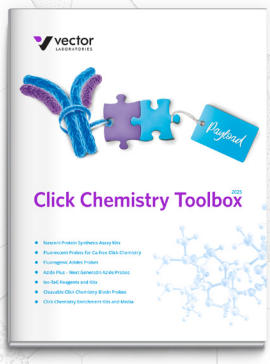
Capture, isolate, and enrich biomolecules that have undergone click labeling to facilitate analysis or purification.

Immobilization and capture strategies in Click Chemistry involve using reactive handles to attach biomolecules to solid surfaces or capture agents, facilitating their isolation or enrichment from complex mixtures. These techniques are crucial for purifying specific targets, such as proteins or small molecules, and enabling high-throughput screening in drug discovery or proteomics.

Precision, Speed, and Versatility— Click Chemistry by Vector Laboratories

Click Chemistry offers high specificity, fast kinetics, and broad versatility, making it the ideal choice for scientists across drug development, biological research, materials science, and environmental sensing. With its variety of options, Click Chemistry enables safe and efficient reactions in living systems and synthetic environments alike.

Vector Laboratories proudly offers a comprehensive portfolio of Click Chemistry tools, providing researchers with reliable, high-quality solutions designed to streamline workflows and deliver consistent, reproducible results across a wide range of applications.



Learn more about tools for Click Chemistry at go.vectorlabs.com/clickchemistry

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