

# EZ-Link Sulfo-NHS-Biotin

MAN0016134

Rev. C.0

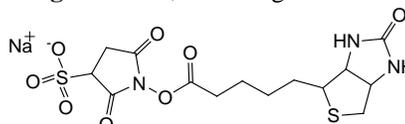
Pub. Part No. 2161850

**21217 A39256**

Number	Description
21217	<b>EZ-Link Sulfo-NHS-Biotin</b> , 50mg
A39256	<b>EZ-Link Sulfo-NHS-Biotin, No-Weigh Format</b> , 10 × 1mg

Molecular Weight: 443.43

Spacer Arm: 13.5Å



**Storage:** Upon receipt store desiccated at -20°C. Product No. 21217 is shipped at ambient temperature. Product No. A39256 is shipped with an ice pack.

**Note:** Product labels have been provided for your convenience. Please label the vials using one of the labels provided in the Al foil pouch to avoid any confusion as you work with this No-Weigh reagent.

## Introduction

Thermo Scientific™ EZ-Link™ Sulfo-NHS-Biotin (sulfosuccinimidobiotin) enables simple and efficient labeling of antibodies, proteins and any other primary amine-containing molecules. Specific labeling of cell surface proteins is another common application for this water-soluble and membrane impermeable reagent. The No-Weigh™ Format is a single-use packaging format that eliminates difficulties associated with weighing small quantities of reagent.

Biotin is a vitamin that binds with high affinity to avidin and streptavidin proteins. Because it is small (244Da), biotin can be conjugated to many proteins without altering their biological activities. Labeled proteins can be purified from unlabeled proteins using immobilized streptavidin and avidin (see Related Thermo Scientific Products) and detected in ELISA, dot blot or Western blot applications using streptavidin or avidin-conjugated probes.

*N*-Hydroxysuccinimide (NHS) esters of biotin are the most popular type of biotinylation reagent. NHS-activated biotins react efficiently with primary amino groups (-NH<sub>2</sub>) in pH 7-9 buffers to form stable amide bonds. Proteins, including antibodies, generally have several primary amines in the side chain of lysine (K) residues and the N-terminus of each polypeptide that are available as targets for labeling with NHS-activated biotin reagents. Several different NHS esters of biotin are available, with varying properties and spacer arm lengths. Sulfo-NHS-Biotin is water soluble, enabling reactions to be performed in the absence of organic solvents such as DMSO or DMF.

Cell surface biotinylation has emerged as an important tool for studying the expression and regulation of receptors and transporters, differentiation of plasma membrane proteins from those localized to organelle membranes, and distribution of membrane proteins in polarized epithelial cells. The specificity of Sulfo-NHS-Biotin for cell surface labeling has been demonstrated in these applications.<sup>1,2</sup> Because Sulfo-NHS-Biotin dissolves readily in polar solutions and is charged by the sodium sulfonate group on the succinimidyl ring, it cannot permeate the cell membrane. As long as the cell remains intact, only primary amines exposed on the surface will be biotinylated.

## Important Product Information

- Sulfo-NHS-Biotin reagents are moisture-sensitive. Store the vial of biotin reagent at -20°C with desiccant. To avoid moisture condensation onto the product, equilibrate vial to room temperature before opening.
- No-Weigh Format: Immediately before use, unscrew the vial and, add water and mix by pipetting up and down. Alternatively, the vial can be vortexed for a few seconds to ensure a homogeneous solution. Store the unused vials in the foil pouch provided.
- As directed in the procedure, dissolve the biotin reagent immediately before use. The NHS-ester moiety readily hydrolyzes and becomes non-reactive; therefore, do not prepare stock solutions for storage. Discard any unused reconstituted reagent.

- Avoid buffers containing primary amines (e.g., Tris or glycine) as these will compete with the intended reaction. If necessary, dialyze or otherwise desalt to exchange the protein sample into an amine-free buffer such as phosphate-buffered saline (see Related Thermo Scientific Products).
- When biotinylating proteins in solution, excess non-reacted biotin and reaction byproducts are easily removed by size exclusion using either desalting columns or dialysis. A 10mL desalting column is best suited for processing reactions involving 1-10 mg of protein in approximately 0.5-2mL. For smaller protein amounts or reaction volumes, both the biotinylation reaction and subsequent buffer exchange can be performed in a single Thermo Scientific™ Slide-A-Lyzer™ MINI Dialysis Unit. For reaction volumes too large for processing with a desalting column, either split the sample between two columns or use an appropriate Slide-A-Lyzer Dialysis Cassette. For processing small volumes (i.e., 10-150µL) of peptides and other low molecular-weight molecules, Thermo Scientific™ Pierce™ C18 Spin Columns (Product No. 89870 or 89873) may be used.

## Additional Materials Required

- Phosphate-buffered saline (PBS) or other amine-free buffer having pH 7-8 for use as reaction buffer
- Desalting columns or dialysis units for buffer exchange

## Procedure for Biotinyating Proteins in Solution

### A. Calculations

The extent of biotin labeling depends on the distribution of amino groups on the protein, protein concentration and the amount of reagent used. Compared to reactions involving concentrated protein solutions, labeling reactions with dilute solutions require a greater fold molar excess of biotin reagent to achieve the same incorporation level. Experiments that used a 20-fold molar excess of biotin reagent to label 1-10mg/mL antibody (in 0.5-2mL) resulted in 4-6 biotin groups per antibody molecule. Experiments that used a 50-fold molar excess of biotin reagent to label 50-200µg of antibody (in 200-700µL) resulted in 1-3 biotin groups per antibody molecule. Adjust the molar ratio of Sulfo-NHS-Biotin to protein to obtain the level of incorporation desired.

1. Calculate millimoles of biotin reagent to add to the reaction for a 20-fold molar excess:

$$\text{mL protein} \times \frac{\text{mg protein}}{\text{mL protein}} \times \frac{\text{mmol protein}}{\text{mg protein}} \times \frac{20 \text{ mmol Biotin}}{\text{mmol protein}} = \text{mmol Biotin}$$

- 20 = Molar fold excess of biotin

2. Calculate microliters of 10mM biotin reagent solution (prepared in Step B.3) to add to the reaction:

$$\text{mmol Biotin} \times \frac{1,000,000 \mu\text{L}}{\text{L}} \times \frac{\text{L}}{10 \text{ mmol}} = \mu\text{L Biotin}$$

**Example:** For 1mL of 2 mg/mL IgG (150,000 MW), ~27µL of 10mM biotin reagent will be added.

$$1 \text{ mL IgG} \times \frac{2 \text{ mg IgG}}{1 \text{ mL IgG}} \times \frac{1 \text{ mmol IgG}}{150,000 \text{ mg IgG}} \times \frac{20 \text{ mmol Biotin}}{1 \text{ mmol IgG}} = 0.000266 \text{ mmol Biotin}$$

$$0.000266 \text{ mmol Biotin} \times \frac{1,000,000 \mu\text{L}}{\text{L}} \times \frac{\text{L}}{10 \text{ mmol}} = 26.6 \mu\text{L Biotin Reagent}$$

---

## B. Biotin Labeling Reaction

1. Remove the vial of biotin reagent from freezer and equilibrate it to room temperature before opening in Step 3.
2. Prepare protein in PBS according to the calculation made in Section A.

**Note:** Protein that is already dissolved in amine-free buffer at pH 7.2-8.0 may be used without buffer exchange or dilution with PBS. Proteins in Tris or other amine-containing buffers must be exchanged into a suitable buffer.

3. Immediately before use, prepare a 10mM solution of the biotin reagent:
  - Product No. 21217: Add 500 $\mu$ L of ultrapure water to 2.2mg of reagent.
  - Product No. A39256: Add 224 $\mu$ L of ultrapure water to the 1mg vial. **The maximum useable volume of the vial is 800 $\mu$ L.**
4. Add the appropriate volume (see Calculations in Section A) of 10mM biotin reagent solution to the protein solution.
5. Incubate reaction on ice for two hours or at room temperature for 30 minutes.

**Note:** Other than the possibility of ordinary protein degradation or microbial growth, there is no harm in reacting longer than the specified time.
6. Protein labeling is complete at this point, and although excess non-reacted and hydrolyzed biotin reagent remains in the solution, it is often possible to perform preliminary tests of the labeled protein by ELISA or Western blot. Once proper function and labeling of the protein has been confirmed, the labeled protein may be purified for optimal performance and stability using desalting or dialysis. If the Thermo Scientific™ Pierce™ Biotin Quantitation Kit (HABA assay; see Related Thermo Scientific Products) will be performed to determine the level of biotin incorporation, the protein first must be desalted or dialyzed to remove nonreacted biotin.

## Procedure for Biotinylating Cell Surface Proteins

Many variations of this procedure exist in the literature (see Product References). Labeling may be performed on cells in suspension or on adherent cells in culture plates. In the latter situation, diffusion of the Sulfo-NHS-Biotin to all surfaces of the cells will be limited, and labeling will occur predominately on the exposed surface. Culture media must be washed from cells; otherwise, amine-containing components will compete and quench the reaction to cell surface proteins. Using a more concentrated cell suspension is most effective because less biotin reagent is required in the reaction. Generally, a final concentration of 2-5mM biotin reagent is effective. NHS reactions occur more rapidly at high pH; therefore, pH 8.0 is used in the following example so that labeling can be completed as quickly as possible.

1. Wash cells three times with ice-cold PBS (pH 8.0) to remove amine-containing culture media and proteins from the cells.
2. Suspend cells at a concentration of  $\sim 25 \times 10^6$  cells/mL in PBS (pH 8.0).
3. Add 1.0mg of Sulfo-NHS-Biotin reagent per milliliter of cell suspension (results in  $\sim 2$ mM biotin reagent). Alternatively, add 200 $\mu$ L of the 10mM biotin reagent solution (see Step B.3 on previous page) per ml of cell suspension.
4. Incubate reaction mixture at room temperature for 30 minutes.

**Note:** Performing this incubation at 4°C may reduce active internalization of the biotin reagent.

5. Wash cells three times with PBS + 100mM glycine to quench and remove excess biotin reagent and byproducts.

## Additional Information

**Please visit our website for additional information including the following:**

- Tech Tip #14: Perform labeling and other reactions in Slide-A-Lyzer Dialysis Cassettes
- Tech Tip #43: Protein stability and storage
- HABA Calculator for computing the results associated with the HABA assay measurements

## Related Thermo Scientific Products

28372	<b>BupH Phosphate Buffered Saline Packs, 40 pack</b>
66382	<b>Slide-A-Lyzer Dialysis Cassette Kits</b>
89892	<b>Zeba Spin Desalting Columns, 7K MWCO, 5mL, 25 columns</b>
28005	<b>Pierce Biotin Quantitation Kit</b>
20347	<b>Streptavidin Agarose Resin, 2mL</b>
21126	<b>Streptavidin, Horseradish Peroxidase Conjugated, 1mg</b>
21925	<b>EZ-Link Micro Sulfo-NHS-Biotinylation Kit</b>

## Cited References

- Daniels, G.M. and Amara, S.G. (1998). Selective labeling of neurotransmitter transporters at the cell surface. *Methods Enzymol* **296**:307-18.
- Huh, K-H. and Wenthold, R.J. (1999). Turnover analysis of glutamate receptors identifies a rapidly degraded pool of the *N*-methyl-D-aspartate receptor subunit, NR1, in cultured cerebellar granule cells. *J Biol Chem* **274**:151-7.

## Product References

- Ali, M.K. and Bergson, C. (2003). Elevated intracellular calcium triggers recruitment of the receptor cross-talk accessory protein calcyon to the plasma membrane. *J Biol Chem* **278**(51):51654-63.
- Boroto, A., *et al.* (2003). Impaired trafficking and activation of tumor necrosis factor- $\alpha$ -converting enzyme in cell mutants defective in protein ectodomain shedding. *J Biol Chem* **278**(28): 25933-9.
- Chyung, J.H. and Selkoe, D.J. (2003). Inhibition of receptor-mediated endocytosis demonstrates generation of amyloid  $\beta$ -protein at the cell surface. *J Biol Chem* **278**(51):51035-43.
- Frickel, E-M., *et al.* (2002). TROSY-NMR reveals interaction between Erp57 and the tip of the calreticulin P-domain. *PNAS* **99**(4):1954-9.
- Gimferrer, I., *et al.* (2003). The accessory molecules CD5 and CD6 associate on the membrane of lymphoid T cells. *J Biol Chem* **278**(10):8564-71.
- Li, H. and Pajor, A.M. (2003). Mutagenesis of the *N*-glycosylation site of hNaSi-1 reduces transport activity. *Am J Physiol Cell Physiol* **285**:C1188-96.
- Lukashevich, I.S., *et al.* (2003). Arenavirus-mediated liver pathology: acute lymphocytic choriomeningitis virus infection of rhesus macaques is characterized by high-level interleukin-6 expression and hepatocyte proliferation. *J Virol* **77**(3):1727-37.
- Ohnishi, T., *et al.* (2003). MD-2 is necessary for the toll-like receptor 4 protein to undergo glycosylation essential for its translocation to the cell surface. *Clin Diagn Lab Immunol* **10**(3):405-10.

Products are warranted to operate or perform substantially in conformance with published Product specifications in effect at the time of sale, as set forth in the Product documentation, specifications and/or accompanying package inserts ("Documentation"). No claim of suitability for use in applications regulated by FDA is made. The warranty provided herein is valid only when used by properly trained individuals. Unless otherwise stated in the Documentation, this warranty is limited to one year from date of shipment when the Product is subjected to normal, proper and intended usage. This warranty does not extend to anyone other than Buyer. Any model or sample furnished to Buyer is merely illustrative of the general type and quality of goods and does not represent that any Product will conform to such model or sample.

NO OTHER WARRANTIES, EXPRESS OR IMPLIED, ARE GRANTED, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR NON INFRINGEMENT. BUYER'S EXCLUSIVE REMEDY FOR NON-CONFORMING PRODUCTS DURING THE WARRANTY PERIOD IS LIMITED TO REPAIR, REPLACEMENT OF OR REFUND FOR THE NON-CONFORMING PRODUCT(S) AT SELLER'S SOLE OPTION. THERE IS NO OBLIGATION TO REPAIR, REPLACE OR REFUND FOR PRODUCTS AS THE RESULT OF (I) ACCIDENT, DISASTER OR EVENT OF FORCE MAJEURE, (II) MISUSE, FAULT OR NEGLIGENCE OF OR BY BUYER, (III) USE OF THE PRODUCTS IN A MANNER FOR WHICH THEY WERE NOT DESIGNED, OR (IV) IMPROPER STORAGE AND HANDLING OF THE PRODUCTS.

Unless otherwise expressly stated on the Product or in the documentation accompanying the Product, the Product is intended for research only and is not to be used for any other purpose, including without limitation, unauthorized commercial uses, in vitro diagnostic uses, ex vivo or in vivo therapeutic uses, or any type of consumption by or application to humans or animals.

Current product instructions are available at [thermofisher.com](http://thermofisher.com). For a faxed copy, call 800-874-3723 or contact your local distributor.

© 2018 Thermo Fisher Scientific Inc. All rights reserved. Unless otherwise indicated, all trademarks are property of Thermo Fisher Scientific Inc. and its subsidiaries. Printed in the USA.