
TCEP, a reducing agent that is odorless and more effective than DTT

Product Description

Hydrosoluble reagent to protect sulfhydryls or cleave disulfide bridges. TCEP replaces advantageously DTT and β -mercaptoethanol, providing no pungent odor, but selective, complete and quantitative reduction in less than 5min. An important advantage is also that it is often not needed to remove TCEP before thiol modification. Main applications are protein modification for conjugation or labeling, and protein reduction before SDS-PAGE electrophoresis.

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| Catalog number : | UP242214, 1g |
| Name : | Tris(2-carboxyethyl)phosphine HCl |
| Formula : | $C_9H_{15}O_6P$ HCl ; CAS : [51805-45-9] |
| Molecular Weight : | 286.65 |
| Storage : | Store at +4°C protected from light and moisture (L) Long term storage recommended at -20°C Harmful / Irritant; R: 20/22; S: 36 |

Product Information

Uptima Tris(2-carboxyethyl)phosphine hydrochloride (TCEP), is a high quality reducing reagent used in various biotechnological techniques and biology applications:

- reducing agent of proteins before SDS-PAGE analysis
 - introducing sulfhydryls in proteins before thiol-specific conjugation or labeling
 - studies of protein structure and function ([Kirley 1989](#))
 - protective reagent for sulfhydryl groups, and acid ascorbic solutions.
- TCEP is soluble in water up 310mg/ml (at the opposite to other phosphines), giving a pH of 2.5. It is non-volatile (odorless). TCEP is stable also in basic conditions, at a higher pH than is DTT and for a longer period of time in buffers without metal chelators such as EGTA; DTT; it is more stable in solutions that contain metal chelators; TCEP is also more stable in the presence of Ni²⁺ levels that commonly contaminate proteins eluted from Ni²⁺ affinity columns and that rapidly oxidize DTT ([Getz 1999](#)).
 - TCEP is generally impermeable to cell membranes and to the hydrophobic protein core, permitting its use for the selective reduction of disulfides that have aqueous exposure.
 - TCEP resists to air oxidation ([Han 1994](#)). Oxidation may however be significant under certain conditions, thus it is recommended to prepare a fresh solution notably if phosphate buffers are used.
 - TCEP reduces even the most stable water-soluble alkyl disulfides, over a wide pH range (1.5-9). The strength of the phosphorus-oxygen bond makes the reaction almost irreversible. Kinetics rather than thermodynamics controls the reduction. Unlike DTT, it retains its reducing power at acid pHs (pH 5) and at pH above 7.5. Complete reduction is usually obtained at room temperature in less than 5 minutes. The

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reduction was shown very complete and rapid under several pH, concentration and buffer conditions ([Han 1994](#), [Mery 1993](#)), and generally more effective than reduction by DTT ([Getz 1999](#)).

- As it does not contain sulfhydryl (at the opposite of DTT), removal of excess TCEP is usually not needed prior to reaction with thiol specific group: unreactivity towards many common alkylating agents and reductions have been carried out simultaneously with alkylations. However, TCEP has been reported to react with haloacetamides or maleimides under certain conditions ([Shafer 2000](#)).
- TCEP do not react toward other functional groups found in proteins. This selectivity allow site specific conjugations.
- TCEP is used at 1-100 molar excess over SS concentration. For protein reduction can be achieved within 30min with 2-3 μ M for aqueous solutions of 2-10mg protein / ml ([Levison 1969](#)).

Literature

Getz EB, Xiao M, Chakrabarty T, Cooke R, Selvin PR. A comparison between the sulfhydryl reductants tris(2-carboxyethyl)phosphine and dithiothreitol for use in protein biochemistry." 1999, Anal Biochem 273, 73-80
Han J.C. et al, A procedure for quantitative determination of tris(2-carboxyethyl)phosphine, an odorless reducing agent more stable and effective than dithiothreitol, Anal. Biochem. 1994, 220, 5-10
Kirley T.L., Reduction and fluorescent labeling of cysteine-containing proteins for subsequent structural analysis, Anal. Biochem. 1989, 180, 231

Levison M.E. et al, Reduction of biological samples by water-soluble phosphines: Gamma-globulin. Experientia 1969, 25, 126-127
Mery J.C. et al, Disulfide linkage to polyacrylic resin for automated Fmoc peptide synthesis. Immunochemical application of peptide, resins and mercaptoamide peptides, 1994, Int.J.Peptide Protein Res. 1993, 42, 44-52
Shafer DE, Inman JK, Lees; Reaction of Tris(2-carboxyethyl)phosphine (TCEP) with maleimide and alpha-haloacyl groups: anomalous elution of TCEP by gel filtration.; A. Anal Biochem 2000, 282, 161-164

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