

Shiga Toxin Type 1 Toxoid, Chemically Inactivated

Catalog No. NR-4674

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Contributor and Manufacturer:

Alison D. O'Brien, Ph.D., Chairperson, and James F. Sinclair, Ph.D., Laboratory Supervisor, Department of Microbiology and Immunology, Uniformed Services University of the Health Sciences, Bethesda, Maryland, under government contract

Product Description:

Recombinant Shiga toxin type 1 (Stx1) was expressed in *Escherichia coli*, purified by affinity chromatography, and chemically inactivated with formaldehyde. The recombinant toxin has a theoretical molecular weight of approximately 32053 daltons for subunit A and 7691 daltons for subunit B. The predicted amino acid sequence is shown below in Table 1 (Subunit A) and Table 2 (Subunit B).

The Shiga toxin (Stx) family refers to two types of related toxins: Shiga toxin type 1 (Stx1, Shiga-like toxin 1, or verotoxin 1) and Shiga toxin type 2 (Stx2, Shiga-like toxin 2, or verotoxin 2).¹ Stx1 is almost identical to Shiga toxin produced by *Shigella dysenteriae* at the nucleotide sequence level, while Stx2 shares approximately 55% overall nucleotide sequence homology with Stx1 and Shiga toxin. Shiga toxins are multimeric molecules that are comprised of two polypeptide subunits, A and B. The B subunit is a pentamer that binds the toxin to glycolipids on host cell membranes and the entire toxin molecule can then enter the cell via endocytosis.² Once inside the cell, the A subunit undergoes proteolytic cleavage and the reduction of an internal disulfide bond to generate Stx A₁ and Stx A₂. Stx A₁ is an N-glycosidase that catalytically inactivates the 28S ribosomal RNA subunit to inhibit protein synthesis.³

The sequences of the structural genes for Shiga toxin from *Shigella dysenteriae* and Shiga toxin type 1 from *E. coli* have been determined. The crystal structure of Shiga toxin from *Shigella dysenteriae* has been solved (PDB: 1DM0).⁴

Material Provided:

Each vial of NR-4674 contains approximately 8 µg of chemically inactivated Stx1 toxoid suspended in PBS (pH 7.4). The protein content and concentration, expressed as mg per mL, are shown on the Certificate of Analysis.

Packaging/Storage:

NR-4674 was packaged aseptically in plastic cryovials. The product is provided frozen on dry ice and should be stored at -70°C or colder immediately upon arrival. Repeated freeze-thaw cycles should be avoided.

Functional Activity:

NR-4674 reacts with rabbit polyclonal antibody to Stx1 and is not cytotoxic to Vero cells at concentrations over 2 logs greater than the CD₅₀ of recombinant Stx1.

Citation:

Acknowledgment for publications should read "The following reagent was obtained through BEI Resources, NIAID, NIH: Shiga Toxin Type 1 Toxoid, Chemically Inactivated, NR-4674."

Biosafety Level: 1

Appropriate safety procedures should always be used with this material. Laboratory safety is discussed in the following publication: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, and National Institutes of Health. Biosafety in Microbiological and Biomedical Laboratories. 5th ed. Washington, DC: U.S. Government Printing Office, 2009; see www.cdc.gov/biosafety/publications/bmbl5/index.htm.

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References:

1. Nakao, H. and T. Takeda. "Escherichia coli Shiga Toxin." *J. Nat. Toxins* 9 (2000): 299-313. PubMed: 10994531.
2. Sandvig, K., et al. "Endocytosis from Coated Pits of Shiga Toxin: A Glycolipid-binding Protein from *Shigella dysenteriae* 1." *J. Cell Biol.* 108 (1989): 1331-1343. PubMed: 2564398.
3. Skinner, L. M. and M. P. Jackson. "Investigation of Ribosome Binding by the Shiga Toxin A1 Subunit, Using Competition and Site-Directed Mutagenesis." *J. Bacteriol.* 179 (1997): 1368-1374. PubMed: 9023224.
4. Calderwood, S. B., et al. "Nucleotide Sequence of the Shiga-Like Toxin Genes of *Escherichia coli*." *Proc. Natl. Acad. Sci. U.S.A.* 84 (1987): 4364-4368. PubMed: 3299365. GenPept: AAA98099 and AAA98100.

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Table 1 – Predicted Protein Sequence for Stx1 Subunit A					
1	KEFTLDFSTA	KTYVDSLNI	RSAIGTPLQT	ISSGGTSLLM	IDSGTGDNLF
51	AVDVRGIDPE	EGRFNNLRLI	VERNLYVTG	FVNRTNNVYF	RFADFSHVTF
101	PGTTAVTLSG	DSSYTTLQRV	AGISRTGMQI	NRHSLTTSYL	DLMSHSGTSL
151	TQSVARAMLR	FVTVTAEALR	FRQIQRGFRT	TLDDLGRSY	VMTAEDVDLT
201	LNWGRLLSSVL	PDYHGQDSVR	VGRISFGSIN	AILGSVALIL	NCHHASRVA
251	RMASDEFPSM	CPADGRVIRI	THNKILWDSS	TLGAILMRRT	I

Table 2 – Predicted Protein Sequence for Stx1 Subunit B					
1	TPDCVTGKVE	YTKYNDDDTF	TVKVGDKELF	TNRWNLQSL	LSAQITGMTV
51	TIKTNACHNG	GGFSEVIFR			