Product Information

Deoxyribonuclease I bovine

Recombinant, expressed in *Pichia pastoris*, buffered aqueous glycerol solution, ≥ 5,000 units/mg protein

D5319

Product Description

CAS Registry Number: 9003-98-9

Enzyme Commission (EC) Number: 3.1.21.1

Synonyms: DNase I,
Deoxyribonucleate 5'-Oligonucleotidohydrolase

Molecular mass: ~39 kDa

Extinction Coefficient: $E_{280}^{1\%}$ = 11.1

Deoxyribonuclease I (DNase I) is an endonuclease that acts on phosphodiester bonds adjacent to pyrimidines to produce polynucleotides with terminal 5'-phosphates. A tetranucleotide is the smallest average digestion product. DNase I hydrolyzes single-stranded and double-stranded DNA.

- In the presence of Mg^{2+} ions, DNase I attacks each strand of DNA independently and the cleavage sites are random.
- If Mn^{2+} ions are present, both DNA strands are cleaved at approximately the same site.[1]

When chromatin DNA is digested, the reaction rate is restricted by the association of DNA with histones.[1]

DNase I is found in most cells and tissues. In mammals, the pancreas is one of the best sources for the enzyme. Pancreatic DNase I was the first isolated DNase.

DNase I can be used to remove DNA from protein and nucleic acid samples, and to nick DNA as a first step to incorporate labeled bases into DNA.

This recombinant bovine DNase I is a glycoprotein, produced without the addition of any animal-derived materials. Several theses[2] and dissertations[3-7] have cited use of product D5319 in their protocols.

Activators

DNase I has an absolute requirement for divalent metal cations:

- Mg^{2+} is the most commonly used divalent cation.[8,9]
- Mn^{2+}, Ca^{2+}, Co^{2+}, and Zn^{2+} will also activate DNase I.[8-10]

A concentration of 5 mM Ca^{2+} will stabilize DNase I against proteolytic digestion. 0.1 mM Ca^{2+} is needed to reduce the rate of inactivation by one-half.[11]

Inhibitors

- 2-Mercaptoethanol (the reduced enzyme is inactive, but can be reactivated in the presence of Ca^{2+} or Mg^{2+} ions)[10]
- Chelators (such as EDTA)
- Sodium dodecyl sulfate (SDS)[12]
- Actin[13]

There is no single general inhibitor specific for DNase I.[2] Citrate inhibits Mg^{2+}-activated DNase I, but not Mn^{2+}-activated DNase I.

Optimal pH

The optimal pH of DNase I activity is dependent on the divalent ion present. In the presence of both Mg^{2+} and Ca^{2+}, the optimal pH is between 7-8, while in the absence of Ca^{2+}, the optimal pH is between 5.5-6.0.[14]

Precautions and Disclaimer

This product is for R&D use only. Not for drug, household, or other uses. Please consult the Safety Data Sheet for information regarding hazards and safe handling practices.

Product

This product is supplied as a solution in 4 mg/mL glycine (pH 5.0), 5 mM calcium acetate, and 50% glycerol.

Specific activity: ≥ 5,000 units/mg protein

Unit definition: One unit will produce a change in A_{260} of 0.001 per minute per mL at pH 5.0 at 25 °C using DNA, Type I or III, as the substrate. This enzyme assay reaction is performed in 83 mM acetate buffer (pH 5.0), at 25 °C, containing 4.2 mM Mg^{2+}, in a 3 mL reaction.

Impurities

Protease: None Detected

RNase: None detected

Storage/Stability

This product retains activity for at least two years when stored at –20 °C.

References

1. Sambrook, J. *et al*., *Molecular Cloning: A Laboratory Manual*, 2nd edition. Cold Spring Harbor Laboratory Press (Cold Spring Harbor, New York, USA), Vol. 2, p. 5.83 (1989).
2. Schöftner, Leonie Christine, "Development of a human 3D skin model to study cutaneous T cells". University of Salzburg, M.Sc. thesis, pp. 18, 21 (2021).
3. Alsiwiehri, Naif, "Identification and characterisation of novel cancer testis antigens in human cancer cells". Bangor University, Ph.D. dissertation, p. 35 (2017).
4. Deans, Jonathan Robert, "The Role of Nuclear Receptors in Tissue-Specific Gene Expression: The Impact of Genetic Variation on DNA Binding". University of California Riverside, Ph.D. dissertation, p. 34 (2017).
5. Hempel, Heidi Anne, "The role of mast cells in prostate cancer initiation and recurrence". Johns Hopkins University, Ph.D. dissertation, p. 55 (2017).
6. Wu, Zhiyuan, "Immunophenotyping of Colorectal Cancer Reveals a Reduction of CD73 Expression on Tumor-Infiltrating Lymphocytes". Friedrich-Alexander-Universität Erlangen-Nürnberg, Dr. med. dissertation, p. 9 (2021).
7. Hinterdobler, Julia Michaela, "Linking inflammation and atherosclerosis – novel mechanistic insights into how vascular inflammation fuels progression of atherosclerosis". Technischen Universität München, Dr. rer. nat. dissertation, p. 31 (2022).
8. Weir, A. F., *Methods Mol. Biol*., **16**, 1-6 (1993).
9. Weir, A. F., *Methods Mol. Biol*., **16**, 7-16 (1993).
10. Price, P. A. *et al*., *J. Biol. Chem*., **244(3)**, 929-932 (1969).
11. Price, P. A., *et al*., *J. Biol Chem*., **244(3)**, 917-923 (1969).
12. Liao, T.-H., *J. Biol. Chem*., **250(10)**, 3831-3836 (1975).
13. Love, J. D., and Hewitt, R. R., *J. Biol. Chem*., **254(24)**, 12588-12594 (1979).
14. Lazarides, E., and Lindberg, U., *Proc. Natl. Acad. Sci. USA*, **71(12)**, 4742-4746 (1974).

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