Product Information

Nuclease P_1 from *Penicillium citrinum*

Lyophilized powder, ≥200 units/mg protein ($E^{1\%}$/280, 3'-5'-Phosphodiesterase)

N8630

Product Description

CAS Registry Number: 54576-84-0

Enzyme Commission (EC) Number: 3.1.30.1

Synonyms: Nuclease 5'-Nucleotidehydrolase, 3'-Phosphohydrolase, Endonuclease P_1

Nuclease P_1 is a zinc-metalloprotein, glycoprotein, and phosphodiesterase that hydrolyzes 3'→5' phosphodiester bonds in both RNA and single-stranded DNA.[1-5] It also cleaves 3'-phosphomonoester bonds in both ribonucleoside-3'-mononucleotides deoxyribonucleoside-3'-mononucleotides. By comparison, Nuclease P_1 is far less effective at hydrolysis of 2'-phosphomonoester bonds of nucleoside-2'-mononucleotides.[1] As one example, Nuclease P_1 hydrolyzes 2'-AMP at a 3,000-fold lower rate compared to hydrolysis of 3'-AMP.[3]

Nuclease P_1 contains 270 amino acid residues and ~17-19% carbohydrate content.[4,6] Three zinc (Zn^{+2}) ions are present per protein molecule.[5] Early studies on the enzyme estimated its molecular mass in the range of 42–50 kDa, by such methods as gel filtration chromatography, sedimentation velocity, sedimentation equilibrium, and SDS-PAGE.[4] A more recent study used SDS-PAGE to obtain a molecular mass value of 43 kDa.[7] Another publication performed mass spectrometry analysis on Nuclease P_1 and determined a molecular mass of 36–37 kDa, by mass spectrometry.[6] Several publications have reported crystallographic studies on Nuclease P_1.[8,9]

Nuclease P_1 has an optimal activity temperature of approximately 70 °C.[2] For long incubations, temperatures at < 60 °C may be more suitable. Nuclease P_1 is optimally active in the pH range of 5-8.[2]

Among various applications,[10] Nuclease P_1 has been used for enzyme-based organic chemistry synthesis reactions.[11] Several theses[12-15] and dissertations[16-23] have cited use of product N8630 in their protocols.

Precautions and Disclaimer

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.

Storage/Stability

Store the product, as lyophilized powder, at 2-8 °C.

Regarding solution stability:

- One publication has reported that a 0.05 mg/mL solution of Nuclease P_1 in 0.1 M ammonium acetate (pH 4.5) lost ~75-80% of its activity after standing at 4 °C for 3 days.[1]
- A different report has indicated that purified Nuclease P_1 in solution can be stored in 50 mM sodium acetate, pH 5.4, with 3 mM zinc ion, for 3 months at 4 °C.[7]
- A further study reports that a Nuclease P_1 solution at 56,400 units/mL activity concentration can be stored at -20 °C for 3 months, although the specific solvent system was not defined.[24]

References

1. Fujimoto, M. *et al*., *Agr. Biol. Chem*., **33(10)**, 1517-1518 (1969).
2. Fujimoto, M. *et al*., *Agr. Biol. Chem*., **38(4)**, 785-790 (1974).
3. Fujimoto, M. *et al*., *Agr. Biol. Chem*., **38(9)**, 1555-1561 (1974).
4. Fujimoto, M. *et al*., *Agr. Biol. Chem*., **39(10)**, 1991-1997 (1975).
5. Rokugawa, K. *et al*., *Agr. Biol. Chem*., **44(8)**, 1987-1988 (1980).
6. Maekawa, E. *et al*., *Eur. J. Biochem*., **200(3)**, 651-661 (1991).

7. Ying, G.-Q. *et al*., *Process Biochem*., **41(6)**, 1276-1281 (2006).
8. Volbeda, A. *et al*., *EMBO J*., **10(7)**, 1607-1618 (1991).
9. Romier, C. *et al*., *Proteins*, **32(4)**, 414-424 (1998).
10. Koval, T., and Dohnálek, J., *Biotechnol. Adv*., **36(3)**, 603-612 (2018).
11. Liu, Z.-Q. *et al*., *Biochimie*, **101**, 156-160 (2014).
12. Coombs, C. Callie, "Developing Liquid Chromatography and Mass Spectrometry Approaches for Studying Posttranscriptional Modifications in Small RNAs". University of Cincinnati, M.S. thesis, pp. 26, 43 (2006).
13. Stone, Themis Mahalia, "Effect of Landscape Position and Dairy Manure Addition on Bioavailable Forms of Soil Phosphorus Using Enzyme Hydrolysis". University of Tennessee Knoxville, Ph.D. dissertation, p. 40 (2011).
14. Park, Noel, "Mitochondrial function and oxidative stress in response to induced reactive oxygen species and reproduction". Auburn University, M.S. thesis, pp. 5, 29 (2018).
15. Poodari, Vinay Chaitanya, "Direct RNA Sequencing of *E. coli* initiator tRNA Using the MinION Sequencing Platform". University of California Santa Cruz, M.S. thesis, p. 14 (2019).
16. Fink, Kristin, "Toxins in Renal Disease and Dialysis Therapy: Genotoxic Potential and Mechanisms". Julius-Maximilians-Universität zu Würzburg, Dr. rer. nat. dissertation, p. 55 (2008).
17. Lu, Chao, "Epigenetic Basis for the Oncogenic Potential of IDH Mutations". University of Pennsylvania, Ph.D. dissertation, p. 82 (2013).
18. Huang, Bridget Yih Jiin, "Regulation of Release Factor 2 in Non-canonical Translation Pathways". Columbia University, Ph.D. dissertation, p. 134 (2017).
19. Hanks, Joanna, "The influence of the MTHFR C677T genotype and folate status on genomic DNA methylation and uracil misincorporation in the colon of subjects without colorectal neoplasia". King's College London (University of London), Ph.D. dissertation, p. 89 (2017).
20. Robinson, Helena, "The role of nucleotide excision repair in providing resistance to the nucleoside analogue gemcitabine". Bangor University, Ph.D. dissertation, p. 39 (2018).
21. Boukouris, Aristeidis, "A Reversible Metabolic Stress-Sensitive Regulation of Collapsin Response Mediator Protein 2A Orchestrates Cytoskeletal Remodeling and EMT, Increasing Metastatic Potential in Cancer". University of Alberta, Ph.D. dissertation, pp. 60, 138 (2021).
22. Duncan-Lowey, Brianna, "Effectors of cell death in bacterial antiphage defense". Harvard University, Ph.D. dissertation, p. 52 (2021).
23. Seck, Anna, "Nucleotide Excision Repair: New approaches to investigate its exceptionally broad substrate specificity". Université Grenoble Alpes, Ph.D. dissertation, p. 91 (2021).
24. Odako, N. *et al*., *Food Chem. Toxicol*., **88**, 21-31 (2016).

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N8630pis Rev 07/22 GCY,HLD,RXR