

## Product Information

## Heparinase I from *Flavobacterium heparinum*

Lyophilized powder stabilized with approx. 25% bovine serum albumin,  $\geq 200$  units/mg protein (enzyme + BSA)

**H2519**

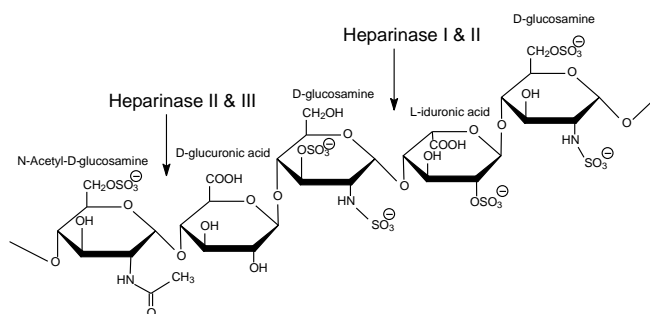
### Product Description

CAS Registry Number: 9025-39-2

Enzyme Commission (EC) Number: 4.2.2.7

Molecular Mass:  $\sim 43$  kDa<sup>1</sup>

Synonym: Heparin lyase I



Heparinases selectively cleave sulfated glycans with  $\alpha(1-4)$  glycosidic linkages between the glucosamine and uronic acid residues in the heparin polymer. The cleavage proceeds via an elimination reaction, to form oligosaccharides with unsaturated uronic acid residues (double bond between C4 and C5). There are three types of heparinases:<sup>2</sup>

- Heparinase I cleaves heparin and heparan sulfate (relative activity about 3:1) at the linkages between hexosamines and O-sulfated iduronic acids, to yield mainly disaccharides.
- Heparinase II cleaves heparan sulfate, and to a lesser extent heparin (relative activity about 2:1), at the 1 $\rightarrow$ 4 linkages between hexosamines and uronic acid residues (both glucuronic and iduronic), to yield mainly disaccharides.
- Heparinase III cleaves at the 1 $\rightarrow$ 4 linkages between hexosamine and glucuronic acid residues in heparan sulfate, to yield mainly disaccharides. The enzyme is not active towards heparin or low molecular weight heparins.

Heparinase I, II, and III will degrade heparin in solution. However, when heparin is added to blood, heparin will bind to thrombin and become unavailable to the heparinase enzyme.

Substrate specificity has been tested for all three types of heparinases and heparin sulfate lyases.<sup>3</sup> Several publications have reported mechanistic studies of heparinase I.<sup>4-10</sup>

Heparin interferes with DNA transcription in PCR, and in reverse transcription of RNA. Heparinase catalytically cleaves heparin in a random fashion.<sup>11</sup> Heparinase I (Cat. No. H2519) and Heparinase II (Cat. No. H6512) have each been used successfully to treat samples to remove that interference.<sup>12</sup> The heparinase can be removed via phenol-chloroform extraction to precipitate the protein.

Several theses<sup>13</sup> and dissertations<sup>14-19</sup> have cited use of product H2519 in their research 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.

### Reagent

This product is supplied as a lyophilized powder stabilized with  $\sim 25\%$  bovine serum albumin (BSA).

Unit Definition: One unit will form 0.1  $\mu$ mole of unsaturated uronic acid per hour at pH 7.5 at 25 °C using heparin sodium as substrate.

International Unit (I.U.) of Heparinase definition: One I.U. will form 1  $\mu$ mole of unsaturated uronic acid per minute. One I.U. is approximately equivalent to  $\sim 600$  Sigma units.

The assay method used for this product is a modification of a published method.<sup>20</sup>

## Storage/Stability

Store the lyophilized powder at -20 °C.

## Preparation Instructions

This enzyme is typically dissolved at 1 mg/mL in 20 mM Tris-HCl, pH 7.5, 50 mM NaCl, 4 mM CaCl<sub>2</sub>, and 0.01% BSA.

## References

1. Yang, V.C. *et al.*, *J. Biol. Chem.*, **260(3)**, 1849-1857 (1985).
2. Godavarti, R., and Sasisekharan, R., *Biochem. Biophys. Res. Commun.*, **229(3)**, 770-777 (1996).
3. Linhardt, R.J. *et al.*, *Biochemistry*, **29(10)**, 2611-2617 (1990).
4. Sasisekharan, R. *et al.*, *Biochemistry*, **34(44)**, 14441-14448 (1995).
5. Sasisekharan, R. *et al.*, *J. Biol. Chem.*, **271(6)**, 3124-3131 (1996).
6. Godavarti, R. *et al.*, *Biochemistry*, **35(21)**, 6846-6852 (1996).
7. Godavarti, R., and Sasisekharan, R., *J. Biol. Chem.*, **273(1)**, 248-255 (1998).
8. Shriver, Z. *et al.*, *J. Biol. Chem.*, **274(7)**, 4082-4088 (1999).
9. Liu, D. *et al.*, *J. Biol. Chem.*, **274(7)**, 4089-4095 (1999).
10. Yu, G. *et al.*, *Thromb. Res.*, **100(6)**, 549-556 (2000).
11. Linhardt, R.J. *et al.*, *Biochem. Biophys. Acta*, **702(2)**, 197-203 (1982).
12. Izraeli, S. *et al.*, *Nucleic Acids Res.*, **19(21)**, 6051 (1991).
13. Gupta, Nupur, "Glycosylation features mediating endothelial interactions of the Lyme disease pathogen *Borrelia burgdorferi*". University of Toronto, M.Sc., thesis, p. 47 (2018).
14. Khoury, Joseph, "Effects of Lipopolysaccharide and Basement Membrane Components on Lung Pericyte Proliferation: Assault and Defence". McGill University, Ph.D. dissertation, pp. 127, 166 (2000).
15. Taylor, Kristen Rea, "Activation of Cutaneous Innate Defense by Glycosaminoglycans". University of California at San Diego, Ph.D. dissertation, p. 38 (2006).

16. Dickey, David Derrick, "Strategies for Improving Adeno-Associated Viral Infection of Airway Epithelial Cells". University of Iowa, Ph.D. dissertation, p. 76 (2012).
17. Shen, Shen, "Understanding and Manipulating AAV-Glycan Interactions". University of North Carolina Chapel Hill, Ph.D. dissertation, p. 30 (2013).
18. Hemphill, Daniel, "Development of an SCAAVIGF-I Gene Therapeutic Vector for the Enhancement of Cartilage Repair". Colorado State University, Ph.D. dissertation, p. 28 (2014).
19. Chernick, Dustin, "HDL Mimetic Peptides as Potential Therapeutics for Alzheimer's Disease". University of Minnesota, Ph.D. dissertation, p. 99 (2018).
20. Linker, A., and Hovingh, P., *Methods Enzymol.*, **28**, 902-911 (1972).

## Notice

We provide information and advice to our customers on application technologies and regulatory matters to the best of our knowledge and ability, but without obligation or liability. Existing laws and regulations are to be observed in all cases by our customers. This also applies in respect to any rights of third parties. Our information and advice do not relieve our customers of their own responsibility for checking the suitability of our products for the envisaged purpose.

The information in this document is subject to change without notice and should not be construed as a commitment by the manufacturing or selling entity, or an affiliate. We assume no responsibility for any errors that may appear in this document.

## Technical Assistance

Visit the tech service page at [SigmaAldrich.com/techservice](https://www.sigmaaldrich.com/techservice).

## Standard Warranty

The applicable warranty for the products listed in this publication may be found at [SigmaAldrich.com/terms](https://www.sigmaaldrich.com/terms).

## Contact Information

For the location of the office nearest you, go to [SigmaAldrich.com/offices](https://www.sigmaaldrich.com/offices).

The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the U.S. and Canada.

MilliporeSigma, and Sigma-Aldrich are trademarks of Merck KGaA, Darmstadt, Germany or its affiliates. All other trademarks are the property of their respective owners. Detailed information on trademarks is available via publicly accessible resources.

© 2022 Merck KGaA, Darmstadt, Germany and/or its affiliates. All Rights Reserved.

H2519pis Rev 04/22 RBG,PCH,GCY

**MILLIPORE  
SIGMA**