



## β-GALACTOSIDASE

### SPECIFICATIONS

**Product Code:** BG11

**Specification:** Predominantly a single band by SDS-PAGE.

**Protein concentration:** >20 mg/ml

Shipped with ice pack for next day delivery. Store at -20°C.

**Stability:** Enzyme is supplied in 50% glycerol, 25 mM sodium phosphate (pH 7.0). Stable at least 12 months when stored properly.

PROZYME® β-Galactosidase (β-D-galactoside galactohydrolase E.C. 3.2.1.23; lactase) is prepared from *Escherichia coli*. The enzyme catalyzes the hydrolysis of lactose and many β-D-galactopyranosides. The DNA sequence of the gene (LacZ) has been determined and encodes a 116,000 dalton polypeptide of 1023 amino acids in addition to the N-terminal f-met.

Wallenfels and Weil (1972) have reviewed the extensive literature on the enzymology of β-Galactosidase. The properties of the enzyme vary depending on both the substrate and buffer; what follows refers to cleavage of *o*-nitrophenyl-β-D-galactopyranoside (ONPG). Monovalent cations such as Na<sup>+</sup> and K<sup>+</sup> are stimulatory (Lederberg, 1950; Neville and Ling, 1967; Becker and Evans, 1969). Divalent cations such as Mg<sup>++</sup> are stimulatory under some conditions (Reithel and Kim, 1960; Wallenfels and Weil, 1972).

Mg<sup>++</sup> is also capable of reversing the inhibition of β-galactosidase by EDTA (Reithel and Kim, 1960). Some divalent cations such as Cu<sup>++</sup>, Pb<sup>++</sup> and Hg<sup>++</sup> are inhibitory (Wallenfels and Weil, 1972). The effects of 2-mercaptoethanol on β-galactosidase are complex: it is stimulatory (as are some other alcohols; Wallenfels and Weil, 1972), but inactivates the enzyme upon storage; although the presence of Mg<sup>++</sup> stabilizes the enzyme (Reithel *et al*, 1966; Shifrin *et al*, 1970), though perhaps not after long periods of exposure.

### CHARACTERISTICS

**Molecular weight:** 465,000 daltons

**Composition:** The enzyme is a homotetramer with subunits of 116,000 daltons.

**Extinction coefficient:**  $E_{280}^{1\%} = 20.9$  (Craven *et al*, 1965)

**pH optimum:** 6.8 (in the presence of Mg<sup>++</sup>; Reithel and Kim, 1960).

**Activators:** Monovalent cations; Mg<sup>++</sup> and some divalent cations; some alcohols including 2-mercaptoethanol.

**Inhibitors:** α-galactosides (Kuby and Lardy, 1953); chelating agents; some heavy metals; organomercuric compounds.

**Isoelectric point:** 4.6 (Wallenfels and Weil, 1972)

**Applications:** *E. coli*  $\beta$ -Galactosidase is a well-characterized protein, and the highly purified form offered by PROZYME is suitable for use as a molecular weight standard for SDS-PAGE.

**Origin:** USA

## REFERENCES

- Becker, V. E. and H. J. Evans. The influence of monovalent cations and hydrostatic pressure on  $\beta$ -galactosidase activity. **Biochim. Biophys. Acta** **191**:95-104 (1969)
- Craven, G. R., Steers, E. Jr. and C. B. Anfinsen. Purification, composition and molecular weight of the  $\beta$ -galactosidase of *Escherichia coli* K12. **J. Biol. Chem.** **240**:2469-2477 (1965).
- Hamaguchi, Y., Yoshitake, S., Ishikawa, E., Endo, Y. and S. Ohtaki. Improved procedure for the conjugation of Rabbit IgG and Fab' antibodies with  $\beta$ -D-galactosidase from *Escherichia coli* using N,N'-o-phenylenedimaleimide. **J. Biochem.** **85**:1289-1300 (1979).
- Imagawa, M., Yoshitake, S., Ishikawa, E., Endo, Y., Ohtaki, S., Kano, E., and Y. Tsunetoshi. Highly sensitive sandwich enzyme immunoassay of human IgE with  $\beta$ -D-Galactosidase from *Escherichia coli*. **Clinica Chimica Acta** **117**:197-207 (1981).
- Ishikawa, E. and K. Kato. Ultrasensitive enzyme immunoassay. **Scand. J. Immunol.** **8(suppl. 7)**:43-55 (1978).
- Kato, K., Fukui, H., Hamaguchi, Y. and E. Ishikawa. Enzyme-linked immunoassay: conjugation of the Fab' fragment of rabbit IgG with  $\beta$ -galactosidase from *E. coli* and its use for immunoassay. **J. Immunol.** **116**:1554-1560 (1976).
- Kuby, S. A. and H. A. Lardy. Purification and kinetics of  $\beta$ -D-galactosidase from *Escherichia coli*, strain K-12. **J. Am. Chem. Soc.** **75**:890-896 (1953).
- Labrousse, H., Guesdon, J. L., Ragimbeau, J. and S. Avrameas. Miniaturization of  $\beta$ -galactosidase immunoassays using chromogenic and fluorogenic substrates. **J. Imm. Meth.** **48**:133-147 (1982).
- Lederberg, J. The  $\beta$ -D-galactosidase of *Escherichia coli*, strain K-12. **J. Bact.** **60**:381-392 (1950).
- Neville, M. C. and G. N. Ling. Synergistic activation of  $\beta$ -galactosidase by Na<sup>+</sup> and Cs<sup>+</sup>. **Arch. Biochem. Biophys.** **118**:596-610 (1967).
- O'Sullivan, M. J., Gnemmi, E., Morris, D., Chiergatti, G., Simmonds, A. D., Simmonds, M., Bridges, J. W. and V. Marks. Comparison of two methods of preparing enzyme-antibody conjugates. Application of these conjugates for enzyme immunoassay. **Analyt. Biochem.** **100**:100-108 (1979).
- O'Sullivan, M. J. and V. Marks. Methods for the preparation of enzyme-antibody conjugates for use in enzyme immunoassay. **Methods in Enzymology** **73**:147-166 (1981).
- Reithel, F. J. and J. C. Kim. Studies on the  $\beta$ -galactosidase isolated from *Escherichia coli* ML308. 1. The effect of some ions on enzymic activity. **Arch. Biochem. Biophys.** **90**:271-277 (1960).
- Reithel, F. J., Newton, R. M. and M. Eagleson. Effects of thiols on *Escherichia coli*  $\beta$ -galactosidases. **Nature** **210**:1265 (1966).
- Shifrin, S., Grochowski, B. J., and S. W. Luborsky. Dissociation of  $\beta$ -galactosidase by thiols. **Nature** **227**:608-609 (1970).
- Wallenfels, K. and R. Weil.  $\beta$ -Galactosidase in **The Enzymes** (P. D. Boyer, ed.), 3rd edition, **vol. 7**:617-663. Academic Press, NY (1972).



1933 Davis Street, Suite 207  
San Leandro, CA 94577-1258

TOLL FREE (800) 457-9444  
PHONE (510) 638-6900  
FAX (510) 638-6919

E-MAIL [info@prozyme.com](mailto:info@prozyme.com)  
WEB [www.prozyme.com](http://www.prozyme.com)