

# Product Information

sigma-aldrich.com

3050 Spruce Street, Saint Louis, MO 63103 USA  
Tel: (800) 521-8956 (314) 771-5765 Fax: (800) 325-5052 (314) 771-5757  
email: techservice@sial.com sigma-aldrich.com

## Butyrylcholinesterase from equine serum

Catalog Number **C1057**

Storage Temperature  $-20\text{ }^{\circ}\text{C}$

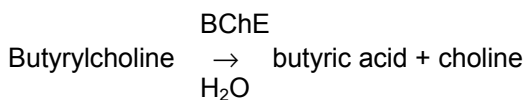
CAS RN 9001-08-5

EC 3.1.1.8

Synonyms: BChE; Acylcholine acylhydrolase;  
Pseudocholinesterase; Non-specific cholinesterase

### Product Description

Butyrylcholinesterase (BChE) belongs to the same structural class of proteins, the esterase/lipase family, as acetylcholinesterase (AChE, EC 3.1.1.7). They are serine hydrolases that share substantial structural similarities, but differ in substrate specificities and inhibitor sensitivities.<sup>1</sup> BChE can, unlike AChE, efficiently hydrolyze larger esters of choline such as butyrylcholine and benzoylcholine.



Although BChE is found in the serum, hemopoietic cells, liver, lung, heart, and the central nervous system of vertebrates, it has no known physiological function.<sup>2,3</sup>

Molecular mass:<sup>4</sup> 440 kDa (tetramer)

BChE is a tetrameric glycoprotein with four equal subunits (110 kDa).<sup>4</sup>

Carbohydrate content (residues/monomer):<sup>5</sup>

Glucosamine	22
Hexoses	17
N-Acetylneuraminic acid	6

Extinction coefficient:<sup>5</sup>  $E^{1\%} = 13.6$  (280 nm)

pH Range:<sup>6</sup> 6.0–8.0

Activators:<sup>2</sup>  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$

Inhibitors:<sup>6</sup> Betaine, nicotine, organophosphates, carbamates

Substrates (relative reaction rate):<sup>5</sup>

Butyrylcholine	1.0
Acetylcholine	0.4
Butyrylthiocholine	0.5
Acetylthiocholine	0.4

Also: propionylcholine, succinylcholine, benzoylcholine, propionylthiocholine

Selective inhibition of BChE activity can be used in the detection of organophosphates.<sup>7</sup> Its use in the treatment of organophosphate toxicity shows promise and there is a correlation between the level of BChE in human blood and degree of protection against potentially toxic nerve agents.<sup>3</sup>

There has also been interest in the roles of cholinesterases with regard to Alzheimer's disease. Investigations into selective inhibitors may provide a clearer picture of the physiological role of BChE in both healthy and diseased individuals.<sup>2</sup>

This product (C1057) is a highly purified preparation. It is prepared chromatographically with procainamide agarose after ammonium sulfate fractionation from equine serum.<sup>8</sup> It is supplied as a lyophilized powder.

Protein:  $\geq 10\%$  (Biuret)  
balance primarily buffer salts

Specific activity:  $\geq 900$  units/mg protein

Unit definition: One unit will hydrolyze 1.0  $\mu\text{mole}$  of butyrylcholine to choline and butyrate per minute at pH 8 at 37  $^{\circ}\text{C}$ . The activity obtained using butyrylcholine as a substrate is  $\sim 2.5$  times that obtained using acetylcholine.

BChE is assayed titrimetrically in a 50.4 ml reaction mixture containing 4 mM butyrylcholine, 1,600 mM  $\text{MgCl}_2$ , 100 mM NaCl, and 30–60 units BChE at pH 8 and 37  $^{\circ}\text{C}$ .

### Precautions and Disclaimer

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

### Preparation Instructions

BChE is soluble in cold water (60 units/ml).

### Storage/Stability

Store the product at  $-20\text{ }^{\circ}\text{C}$ . When stored at  $-20\text{ }^{\circ}\text{C}$ , the enzyme retains activity for at least 1 year.

### References

1. Kovarik, Z., *et al.*, Acetylcholinesterase active centre and gorge conformations analysed by combinatorial mutations and enantiomeric phosphonates. *Biochem. J.*, **373**, 33-40 (2003).
2. Savini, L., *et al.*, Specific targeting of acetylcholinesterase and butyrylcholinesterase recognition sites. Rational design of novel, selective, and highly potent cholinesterase inhibitors. *J. Med. Chem.*, **46**, 1-4 (2003).
3. Blong, R.M., *et al.*, Tetramerization domain of human butyrylcholinesterase is at the C-terminus. *Biochem. J.*, **327**, 747-57 (1997).
4. Lee, J.C., and Harpst, J.A., Physical properties and subunit structure of butyrylcholinesterase from horse serum. *Biochemistry*, **12**, 1622-30 (1973).
5. Main, A., *et al.*, The purification of cholinesterase from horse serum. *Biochem. J.*, **143**, 733 (1974).
6. Augustinsson, K., Butyryl and Propionyl-cholinesterases and Related Types of Serine-Sensitive Esterases. In *The Enzymes, IV*, (Boyer, P., *et al.*, eds.), Academic Press, (New York, NY: 1960) p. 521.
7. Beattie, B.D., *et al.*, Determination of butyrylcholinesterase inhibition using ion transfer across the interface between two immiscible liquids. *Anal. Chem.*, **66**, 52-57 (1994).
8. Ralston, J.S., *et al.*, Use of procainamide gels in the purification of human and horse serum cholinesterases. *Biochem. J.*, **211**, 243-250 (1983).

GRO,JWM,RBG,MAM 01/08-1

Sigma brand products are sold through Sigma-Aldrich, Inc.

Sigma-Aldrich, Inc. warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see reverse side of the invoice or packing slip.