

## Product Information

### Acetylcholinesterase

from *Electrophorus electricus* (electric eel)

Catalog Number **C2888**

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

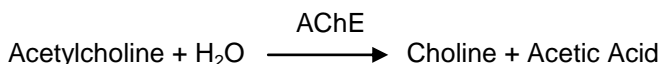
CAS RN 9000-81-1

EC 3.1.1.7

Synonyms: AchE, Acetylcholine acetylhydrolase, cholinesterase, true cholinesterase

### Product Description

Acetylcholinesterase (AChE) is a membrane-bound enzyme found in excitable tissues, such as synaptic junctions, and is involved in nerve impulse transmission.<sup>1</sup> It is the major enzyme responsible for the degradation of acetylcholine *in vivo*, using the following reaction.



A model of the mechanism of AChE, which may explain its high catalytic rate with acetylcholine, has been proposed.<sup>2</sup>

Acetylcholinesterase, like butyrylcholinesterase (BChE; EC 3.1.1.8), is a serine hydrolase that belongs to the esterase/lipase family. AChE and BChE share substantial structural similarities, but differ in substrate specificities and inhibitor sensitivities.<sup>3</sup> Using acetylcholine as a substrate, electric eel AChE has an activity 30-100 times greater than when butyrylcholine is used as the substrate.

AChE is a specific cholinesterase. It is a polymeric glycoprotein with two  $\alpha$  and two  $\beta$  chains that differ by the C-terminus polypeptide.<sup>4</sup> The molecule has two catalytic sites.<sup>13</sup> Guanidine and 2-mercaptoethanol are required to release the four subunits. AChE exists in three different molecular forms as a result of different C-terminus splicing schemes.<sup>5</sup> The three molecular forms have sedimentation coefficients of approximately 8, 14, and 18S.<sup>1,6</sup> Using proteolytic enzymes, these forms can be converted to a form with a sedimentation coefficient of 11S. This form is similar to that purified from toluene-treated tissue.

AChE has applications in the detection of organophosphate and carbamate insecticides,<sup>3</sup> the development of sensors for direct detection of organophosphates,<sup>7</sup> the study of nerve impulse conduction, and the generation of biochemical currents.

Electric eel AChE exists as a tetrameric glycoprotein containing saccharides related or identical to sialic acid, *N*-acetylglucosamine, *N*-acetylgalactosamine, mannose and/or glucose, and, galactose.<sup>9)</sup>

Molecular mass:<sup>4,8,10</sup> 230–260 kDa

Isoelectric point:<sup>11</sup> 5.35

Optimal pH: 7.6

Extinction coefficient:  $E_{280}^{1\%} = 18.0$

Inhibitors: Fasciculin 2, huperzine-A, physostigmine (eserine), tetrahydroaminoacridine, diisopropylfluorophosphate

$K_i$ :<sup>12</sup> Fasciculin 2, 0.33 mM (23  $^{\circ}\text{C}$ , pH 8)

This enzyme is purified from the electric organ of the eel *E. electricus*. The product is supplied as a light yellow to tan lyophilized powder containing Trizma<sup>®</sup> buffer salts.

Specific activity:  $\geq 1,000$  units/mg

Unit definition: one unit will hydrolyze 1.0  $\mu\text{mole}$  of acetylcholine to choline and acetate per minute at pH 8.0 and 37  $^{\circ}\text{C}$ .

This enzyme assay reaction is performed titrimetrically in a 50.4 mL reaction mixture containing 4 mM acetylcholine chloride, 40 mM  $\text{MgCl}_2$ , 100 mM NaCl, and 12–24 units AChE, at pH 8.0 at 37  $^{\circ}\text{C}$ .

Protein:  $\geq 60\%$

### 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.

### Preparation Instructions

The enzyme is soluble in water (1 mg/mL), and is also soluble in 0.1 M Trizma-HCl, pH 7.5 (2 mg/mL), yielding a clear solution. The enzyme can be solubilized and diluted in 0.02 M sodium phosphate buffer, pH 7.0. For dilute enzyme solutions (<1 mg/mL), add 1 mg/mL of BSA to stabilize the enzyme.

### Storage/Stability

The enzyme is stable at -20 °C for >2 years.

For stabilization of AChE solutions, especially dilute solutions, add 1 mg/mL of BSA. These solutions will be stable in the refrigerator for at least six months. Because AChE is acid-labile, solutions must be buffered near neutral pH.<sup>3</sup>

### References

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KAD,RBG,GCY,JWM,MAM 10/18-1