

## Product Information

### Acetylcholinesterase

From *Electrophorus electricus* (electric eel)

Product Number **C2888**

Storage Temperature -20 °C

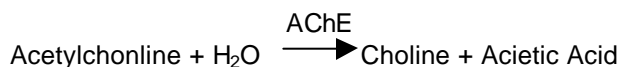
CAS RN 9000-81-1

E.C. 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 enzyme's mechanism, which may explain its high catalytic rate with the acetylcholine, has been proposed.

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>

AChE is a specific cholinesterase. It is a polymeric glycoprotein with 2  $\alpha$  and 2  $\beta$  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.

Using acetylcholine as a substrate, electric eel AChE has an activity 30-100 times greater than when butyrylcholine is used as the substrate.

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

Molecular Weight:<sup>4,8,9</sup> 230-260 kDa

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>10</sup>

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

Optimum 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 °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 Tris buffer salts.

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

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

This enzyme assay reaction is performed titrimetrically in a 50.4 ml reaction mixture containing 4 mM acetylcholine chloride, 40mM MgCl<sub>2</sub>, 100 mM NaCl, and 12-24 units AChE, at pH 8.0 at 37 °C.

Protein:  $\geq 60\%$  (biuret)

### 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

The enzyme is soluble in water (1 mg/ml) and is also soluble in 0.1 M Tris-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

For stabilization of enzyme solution, 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.<sup>3</sup>

### References

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