Acetylcholinesterase  
*From Electrophorus electricus* (electric eel)

**Product Information**

**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. It is the major enzyme responsible for the degradation of acetylcholine in vivo, using the following reaction.

\[
\text{Acetylcholine} + \text{H}_2\text{O} \rightarrow \text{Choline} + \text{Acetic Acid}
\]

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.

AChE is a specific cholinesterase. It is a polymeric glycoprotein with 2 α and 2 β chains that differ by the C-terminus polypeptide. The molecule has two catalytic sites. 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. The three molecular forms have sedimentation coefficients of approximately 8, 14, and 18S. Using proteolytic enzymes these forms can be converted to a form with a sedimentation coefficient of 115. This form is similar to that purified from toluene treated tissue.

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

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

**Molecular Weight**: 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.

**Isoelectric Point**: 5.35

**Optimum pH**: 7.6

**Extinction coefficient**: \( E_{1\%}^{1\%} = 18.0 \)

**Inhibitors**:  
Fasciculin 2; huperzine-A; physostigmine (eserine); tertahydroaminoacridine; diisopropylfluorophosphate

\( K_i \): 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**: ≥1,000 units/mg

**Unit definition**: one unit will hydrolyze 1.0 µmole 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 MgCl₂, 100 mM NaCl, and 12-24 imots AChE, at pH 8.0 at 37 °C.

**Protein**: ≥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.

References
5. Leuzinger, W., The number of catalytic sites in acetylcholinesterase, Biochem. J., 123, 139-41, (1971).