

CHOLESTEROL ESTERASE [CEN II]

from *Pseudomonas* sp.
(Steryl-ester acylhydrolase, EC 3.1.1.13)
(Sterol esterase)



Preparation and Specification

Appearance : White to pale brownish amorphous powder, lyophilized
Specific activity : More than 100 U/mg solid

Properties

Substrate specificity : See Table 1
Molecular weight : 30kDa (SDS-PAGE)
Isoelectric point : pH 5.28 (estimated from amino acid sequence)
Optimum pH : 6.5 Figure 1
pH stability : 6.0-11.0
(37°C, 60 min, in 0.1% BSA) Figure 2
Optimum temperature : 35-40°C (Phosphate Buffer) Figure 3
Thermal stability : Stable at 45°C and below (pH 8.0, 30min) Figure 4 and Figure 5
Storage stability : At least one year at -20°C Figure 6
Effect of coexisting ions : See Table 2
Effect of detergents : See Table 3 and Table 4
Activator : Adekatol TN-100, Adekatol PC-8, Adelatol SO-120,
Adekatol SO-135, Triton X-100

Applications for Diagnostic Test

This enzyme is useful for enzymatic determination of **total cholesterol**, **HDL-C**, and **LDL-C** coupled with cholesterol oxidase (T-101) .

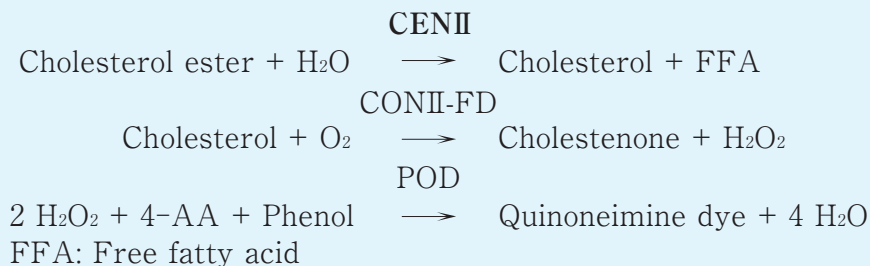


Table 1. Substrate specificity

Substrate			Relative activity (%)	
			CEN II	CEN (T-18)
Cholesterol	Acetate	C 2:0	22.6	21.1
Cholesterol	Propionate	C 3:0	27.7	28.1
Cholesterol	Butyrate	C 4:0	78.3	78.9
Cholesterol	Palmitate	C 16:0	37.9	42.2
Cholesterol	Stearate	C 18:0	13.2	13.0
Cholesterol	Oleate	C 18:1	100.0	100.0
Cholesterol	Linolate	C 18:2	80.9	78.1

Table 2. Effect of various chemicals on CEN II activity

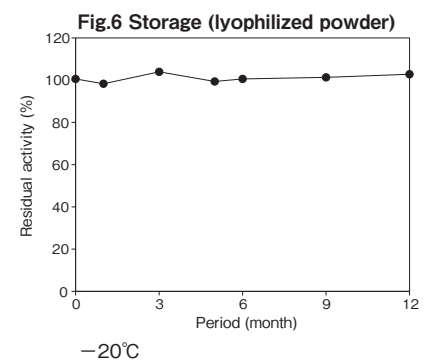
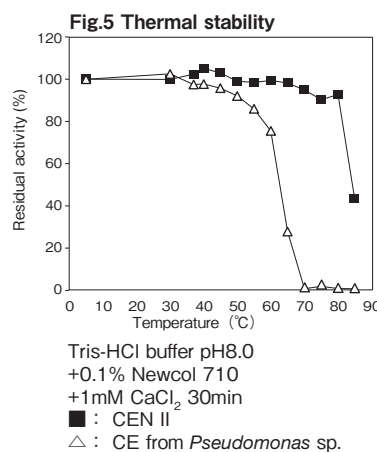
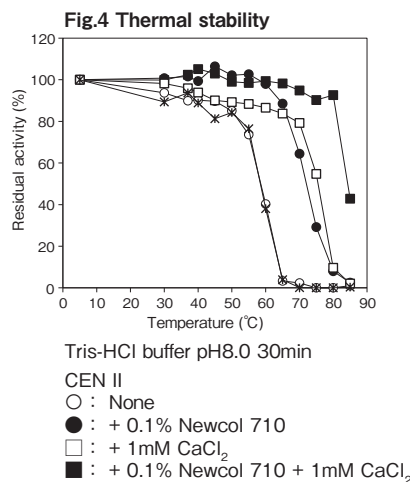
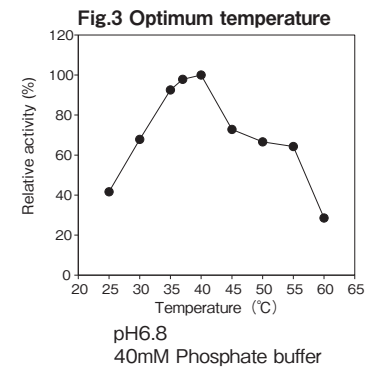
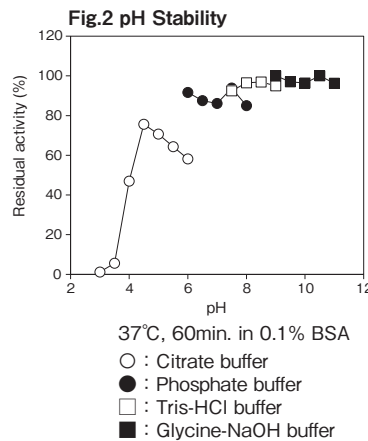
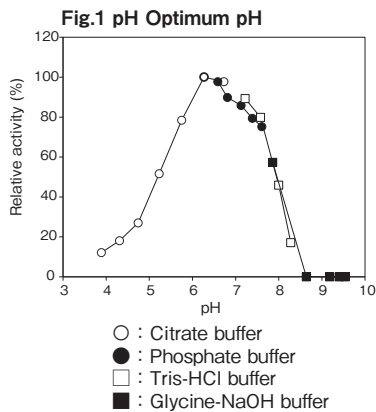
Additives	Concentration	Relative activity (%)
None	-	100
NiCl ₂	1mM	67
MnCl ₂	1mM	101
(NH ₄) ₂ SO ₄	1mM	107
MgCl ₂	1mM	106
ZnCl ₂	1mM	87
ZnSO ₄	1mM	81
Ba(CH ₃ COO) ₂	1mM	106
CaCl ₂	1mM	114
MoSO ₄	1mM	69
CuSO ₄	0.5mM	3
CuCl ₂	0.5mM	0
FeCl ₃	1mM	102
CoCl ₂	1mM	86
Li ₂ CO ₃	1mM	100
CH ₃ COOT	1mM	104
EDTA	1mM	101
KCl	0.1M	97
NaCl	0.1M	98
NaN ₃	0.05%	102
NaF	20mM	98

Table 3. Effect of detergents on CEN II activity

Detergent (0.3%)	Relative activity (%)
None	100
Triton X-100	147
Adekamol TN-100	146
Adekamol SO-120	142
Newcol 707	146
Newcol 710	139
Emulgen 120	144
Emulgen 705	159
Sodium cholate	103
Deoxycholic acid	128
Sodium dodecyl sulfate	1.1
Sucrose fatty acid ester	144

Table 4. Effect of detergents on CEN II activity when switching from Triton X-100 to other detergents

Detergent (0.3%)	Relative activity (%)
Triton X-100	100
Adekamol SO-120	61
Adekamol SO-135	69
Adekamol TN-100	82
Adekamol PC-8	81
Tween 20	1
Tween 40	1
Tween 80	1
Sodium Cholate	0
Brij 35	2
CHAPSO	0
Benzyltriethylammonium Chloride	1
Sodium dodecyl sulfate	0
Emulgen LS-110	30
Newcol 710	13
None	0

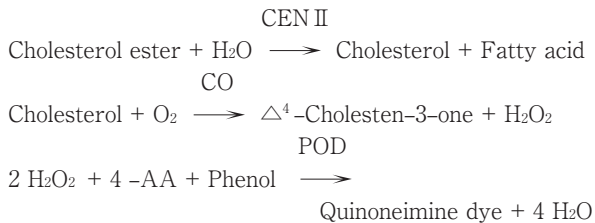


CEN (T-18)
* : None

Assay

■ Principle

The assay is based on the increase in absorbance at 493 nm as the formation of quinoneimine dye proceeds in the following reactions:



CO: Cholesterol oxidase

■ Unit definition

One unit is defined as the amount of enzyme which liberates 1 μ mole of cholesterol per minute at 37°C under the conditions specified in the assay procedure.

■ Reagents

- Reaction mixture

0.2M KH ₂ PO ₄ -NaOH buffer pH 6.8	0.60 ml
0.35% (W/V) 4-AA solution	0.30 ml
0.2% (W/V) Phenol solution	0.30 ml
100 U/ml POD solution ¹⁾	0.30 ml
3% (W/V) Triton X-100 solution	0.30 ml
0.2 U/ml CONII solution ²⁾	0.60 ml

Substrate solution ³⁾	0.30 ml
Distilled water	0.30 ml

1) : 100 U/ml POD solution
Dissolve 1000 U (PPU) of POD with 10 ml of distilled water.

2) : 0.2 U/ml CONII solution
Dissolve 2 U of CONII with CONII dilution buffer ^{※)}
※) : CONII dilution buffer
0.1 M KH₂PO₄-Na₂HPO₄ buffer pH 7.0
containing 0.05% (W/V) Triton X-100.

3) : Substrate solution
Calf serum
- Enzyme dilution buffer
10 mM KH₂PO₄-NaOH buffer pH 7.5 containing 0.1% (W/V) bovine serum albumin (BSA) .
- Reagents
Triton X-100: The Dow Chemical Company
CONII : Asahi Kasei Pharma Corporation #T-84
Calf serum: GIBCO Co. (USA)
BSA: Millipore Fraction V pH 5.2 #81-053
4-AA: NACALAI TESQUE, INC. Special grade #01907-52
POD: Sigma Chemical Co. Type II #P-8250

■ Enzyme solution

Accurately weigh about 20 mg of the sample and add enzyme dilution buffer to make a total of 20 ml. Dilute it with enzyme dilution buffer to adjust the concentration to within 0.3-0.5 U/ml.

■ Procedure

- Pipette accurately 3.0 ml of reaction mixture into a small test tube and preincubate it at 37°C.
- After 10 min, add 50 μ l of enzyme solution and mix to start the reaction at 37°C.
※ In the case of a test blank, add 50 μ l of enzyme dilution buffer in place of enzyme solution.
- After starting the reaction, measure the rate of increase per minute in absorbance at 493 nm. The rate must be measured within the linear portion of the absorbance curve.

Absorbance sample : As/min

blank : Ab/min

$$\Delta A/\text{min} = (A_s/\text{min} - A_b/\text{min}) \leq 0.050 \text{ Abs}/\text{min}$$

■ Calculation

$$\text{Activity (U/mg of powder)} = \frac{\Delta A/\text{min}}{12.0 \times 1/2} \times \frac{3.05}{0.05} \times \frac{1}{X}$$

12.0 : millimolar extinction coefficient of quinoneimine dye at 493 nm (cm²/μmole)

1/2 : a multiplier derived from the fact that 2 mole of H₂O₂ produce 1 mole of quinoneimine dye

3.05 : final volume (ml)

0.05 : volume of enzyme solution (ml)

X : concentration of the sample in enzyme solution (mg/ml)

Storage

Storage at -20°C in the presence of a desiccant is recommended. Enzyme activity will be retained for at least one year under this condition (Figure 6).

References

- Bradford, M. B., (1976) *Anal. Biochem.*, **72**, 248-254.
- Allain, C. C., Poon, L. S., Chan, C. S. G., Richmond, W. and Fu, P.C. (1974) *Clin. Chem.*, **20**, 470-475.
- Kameno, Y., Nakano, N. and Baba, S. (1976) *Japanese Journal of Clinical Pathology*, **24**, 650.

CEN II 活性測定法 (Japanese)

I. 試薬液

1. 反応試薬混合液

0.2M KH ₂ PO ₄ -NaOH 緩衝液 pH6.8	0.60 ml
0.35% (W/V) 4-AA 溶液	0.30 ml
0.2% (W/V) フェノール溶液	0.30 ml
100U/ml POD 溶液 ¹⁾	0.30 ml
3% (W/V) トリトン X-100 溶液	0.30 ml
0.2U/ml CONII 溶液 ²⁾	0.60 ml
基質溶液 ³⁾	0.30 ml
精製水	0.30 ml

1): 100U/ml POD 溶液

POD 1,000 単位 (PPU) を精製水 10ml で溶解する。

2): 0.2U/ml CONII 溶液

CONII 2 単位 (U) を CONII 溶解用液^{※)} 10ml で溶解する。

※): CONII 溶解用液

0.05% (W/V) トリトン X-100 を含む 0.1M KH₂PO₄-Na₂HPO₄ 緩衝液 pH7.0

3): 基質溶液

仔牛血清液

2. 酵素溶解希釈用液

0.1% (W/V) BSA を含む 10mM KH₂PO₄-NaOH 緩衝液 pH7.5

3. 試薬

トリトン X-100: Dow Chemical 製

CONII (コレステロール酸化酵素):

旭化成ファーマ製 #T-84

仔牛血清液 (Calf serum): GIBCO (USA) 製

BSA: Millipore 製 Fraction V pH5.2 #81-053

4-AA: ナカライテスク製 特級 #01907-52

POD: シグマ製 Type II #P-8250

II. 酵素試料液

検品約 20mg を精密に量り、酵素溶解希釈用液に溶解して全容 20ml とする。

その液を酵素溶解希釈用液で 0.3~0.5U/ml 濃度となるように適宜希釈する。

III. 測定操作法

1. 小試験管に反応試薬混合液を 3.0ml 正確に分注して 37°C で予備加温する。

2. 10 分経過後、酵素試料液 50 μl を正確に加えて混和し、37°C で反応を開始する。

※盲検は酵素試料液の代わりに酵素溶解希釈用液 50 μl を加える。

3. 反応開始後、493nm における吸光度を測定して直線的に反応している 1 分間当たりの吸光度変化を求める。

求められた吸光度変化を試料液は A_s/min、盲検液は A_b/min とする。

$\Delta A/\text{min} = (A_s/\text{min} - A_b/\text{min}) \leq 0.050 \text{ Abs}/\text{min}$

IV. 計算

$$\text{活性 (U/mg)} = \frac{\Delta A/\text{min}}{12.0 \times 1/2} \times \frac{3.05}{0.05} \times \frac{1}{X}$$

12.0: キノンイミン色素の 493nm におけるミリモル分子吸光係数 (cm²/μmole)

1/2: H₂O₂ 2 モルからキノンイミン色素 1 モルが生成することによる係数

3.05: 反応総液量 (ml)

0.05: 反応に供した酵素試料液量 (ml)

X: 酵素試料液中の検品濃度 (mg/ml)