# CAMPO
# Apple Enzymes Extract


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**CAMPO® Multi-Purpose Cosmetic Base Chemicals & Active Ingredients**

**CAMPO® Novel Functional Active Cosmetic Ingredient & Raw Materials**

# Index



*IMPORTANT NOTICE*

Specifications may change without prior notice. Information contained in this technical literature is believed to be accurate and is offered in good faith for the benefit of the customer. The company, however, cannot assume any liability or risk involved in the use of its natural products or their derivatives, since the conditions of use are beyond our control. Statements concerning the possible use are not intended as recommendations to use our products in the infringement of any patent. We make no warranty of any kind; expressed or implied, other than that the material conforms to the applicable standard specifications.

**Ask about our Herbal Natural Products Chemistry Consultancy Services – Product Registration EEC/UK New Drug Development (NDA-US); Quasi-Drug Topicals (MOHW_Japan); Development of Standards, Analysis & Profiles of Phytochemicals; Literature searches, Cultivation of Medicinal Plants, Clinical-Trials, Development of new uses for Phytochemicals and Extracts; Contract Research and Development Work in Natural Products for Novel Drugs, New Cosmetic Active Ingredients for Active Topica/OTC Cosmetic with functionality and Consumer-perceivable immediate-results, New Food Ingredients for Nutraceuticals & Functional Foods.**

# Index

## TAXONOMY

# Malus domestica

*Taxonomy Id:* **3750**

*Preferred common name:* **apple tree**

*Rank:* **species**

*Genetic Code*: **Standard [SGC0]**

*Mitochondrial genetic code:* **Standard [SGC0]**

*Other Names:*
**Malus pumila** [synonym], **Malus x domestica** [synonym], **Malus domestica Broth**
[Synonym], **apple** [common name], **apples** [common name]

*Lineage (abbreviated):*
Eukaryotae; mitochondrial eukaryotes; Viridiplantae; Charophyta/Embryophyta group;
Embryophyta; Magnoliophyta; Magnoliopsida; Rosales; Rosaceae; Malus.

**Nucleotide** (40) **Protein** (67)

# GenBank (95.0,6/15/96).
# Accession: U03294

GenBank (NCBI, Bethesda, Md. USA)

| | |
|---|---|
| **LOCUS** | MSU03294 1618bp mRNA PLN 17-NOV-1993 |
| **DEFINITION** | Malus sylvestris 1-aminocyclopropane-1-carboxylate synthase mRNA partial cds. |
| **ACCESSION** | U03294 |
| **NID** | G417971 |
| **KEYWORDS** | |
| **SOURCE** | Malus sylvestris. |
| **ORGANISM** | Malus syslvestris<br>Eukaryotae: mitochondrial eukaryotes; Viridiplantae; Charophyta/Embryophyta group; Embryophyta; Magnoliophyta; Magnoliopsida; Rosales; Rosaceae; Malus; |
| **REFERENCE** | 1 (bases 1 to 1618) |
| **AUTHORS** | Dong, J.G.., Kim, W.T. Yip, w.k., Thompson, G.A, Li, L., Bennett,A and Yang, S.F |
| **TITLE** | Cloning of a cDNA encoding 1-aminocyclopropane-1-carboxylate synthase and expression of its mRNA in ripening apple fruit |
| **JOURNAL** | Planta 185, 38-45 (1991) |
| **REFERENCE** | 2 (bases 1 to 1618) |
| **AUTHORS** | Dong, J. G. |
| **TITLE** | Direct submission |
| **JOURNAL** | Submitted (09-NOV-1993) Jian G. Dong, Vegetable Crops, University of California at Davis, Mann Lab, Davis, CA 95616-8631, USA |

# CAMPO TOTAL APPLE'S ENZYMES EXTRACT

Campo Total Apple's Enzymes Extract is prepared from an assayed, free-dried preparation contains the following enzymes in a novel new non-human and non-animal protein matrix-Campo's novel biotechnologic cloned vegetable matrix:

***Acid Phosphatase, Alanine Aminotransferase (ALT/GPT), α-amylase, Aldolase, Alkaline Phosphatase, Aspartate Aminotransferase (AST/GOT), y-Glutamyl Transpeptidase, α-Hydroxybutyrate Dehydrogenase, Leucine Aminopeptidase, Lipase, Phosphohexose isomerase.***

The **" Elevated Level" of our Total Apple's Enzymes Extract** is offered in a clear colorless liquid of diluted 10 x 3 biotechnologic -cloned vegetable matrix.

The elevated level does not cause irritation potential and discoloration or will not cause uncontrolled enzymatic, kinetic or endpoint functions in the end-formulations.

The **Total Apple's Enzymes Extract** is unique novel configuration of stable blend in biotechnologic cloned vegetable protein matrix instead of animal or human protein matrix, as all enzymes when cloned and refined from the nucleic acid are unstable in any other matrices; while the cosmetic industry need special stable functional Enzymatic extract instead of the current Diagnostic Enzymes for Medical Diagnostic used now in Cosmetic formulations.

**For Best Functional Results:** Addition of Approx. 5% is suggested

**Types of Products:** Body-care, Colour Cosmetics and Special Treatment Hair Care for flaky scalp and brittle / dry hair.

# SPECIFICATIONS

| | |
|---|---|
| **Plant species** | Malus domestica / Pyrus Malus |
| **Plant part used** | Fructus |
| **INCI / CTFA Name (Proposed)** | Pyrus Malus (Apple ) Fruit Extract (AND) Malus Domestica Fruit Extract (AND) Water |
| **Appearance** | Light Yellowish Brown Liquid |
| **Odour** | Slight Characteristic |
| **PH Value (20°C)** | 6.9 - 7.4 |
| **Specific Gravity (20°C)** | 1.11 - 1.32 |
| **Refractive Index (20°C)** | 1.35 - 1.45 |
| **Dry Residue (160°C, 35 min.)** | 45% - 60% |
| **Microbiology** | Less than 100 germs / ml - Non-pathogens |

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**INTERNATIONAL ENZYMES TEST METHODS & PROCEDURES NUMBER**

| Int'l Procedure # | Enzymes | Test Methods |
|---|---|---|
| 104 | Acid Phosphatase | *Calorimetric, Endpoint* |
| 505 | Alanine Aminotransferase (ALT / GPT) | *Calorimetric, Endpoint* |
| 752 | Aldolase | *Calorimetric, Endpoint* |
| 104 | Alkaline Phosphatase | *Calorimetric, Endpoint* |
| 700 | Amylase | *Calorimetric, Endpoint* |
| 505 | Aspartate Aminotransferase (AST / GOT) | *Calorimetric, Endpoint* |
| 545 | y-Glutamyl Transferees (y-GT) | *Calorimetric, Endpoint* |
| 500 | Lactate Dehydrogenate (LD) | *Calorimetric, Endpoint* |
| 340-UV | Lactate Dehydrogenate (LD-P) | *UV-Kinetic* |
| 251 | Leucine Aminopeptidase(LAP) | *Calorimetric, Endpoint* |

# CAMPO TOTAL APPLE'S ENZYMES EXTRACT

## COMPOSITION

| | |
|---|---|
| Acid Phosphates | 0.0010% |
| Alanine Aminotransferase (ALT/GPT) | 0.1030% |
| α-Amylase | 0.3000% |
| Aldolase | 2.0070% |
| Alkaline Phosphatase | 1.8820% |
| Aspartame Aminotransferase (AST/GOT) | 3.9000% |
| Y-Glutamyl transpeptidase | 4.1000% |
| α-Hydroxybutyrate Dehydrogenase | 5.0000% |
| Leucine Aminopeptidase | 7.2001% |
| Lipase | 10.0000% |
| Phosphohexose isomerase | 1.0000% |

Other Apple Fruit Enzymes & Pro-Enzymes and Vegetal Protein Matrix Carrier Complex 20% - 24%
[Lactate Dehydrogenate (LD), Lactate Dehydrogenate (LD-P); Lucien Aminopeptidase (LAP); and Vegetal Peptides / Proteins, etc. ]

The following blend / composition in a cosmetic formula will act as an enzymatic activator of aging skin rejuvenator that reverse aged skin to young skin via the enhanced enzymatic biosynthesis and pathway to increase the loss of enzymatic activity usually noted in aged skin conditions.

The fine lines will disappear and loss of water retention capacity will be reinstated as in the normal young skin.

The actions of these natural established enzymes from apples are functional in natural facial skin peeling over a period of time via their (enzymes) enzymatic natural actions without blotches and irregular patches of skin peel instead of unlike the α-Hydroxy acids which harshly peel the facial skin in uneven; irregular or very unnatural skin peeling.

The flow of natural facial skin moisturizing factors will increase as the enzymatic actions will clear the clogged facial skin pores and these enzymatic cleaned skin pores will shrinked to natural sizes thereby enhancing the facial tightening and rejuvenation effect as experienced in young skins.
An important function of the enzymes is the mimic activity equivalent to human retinal A is experienced in facial skin, as the enzymatic actions will increase

production of natural human vitamin A (Retinal A) in the facial skin as required by the young skin conditions.

The total activity of retinal A is increased in the aged skin thereby causing a "pronounced effect" in reversal activity to conditions as experienced in young skins.

These enzymes are very stable in storage or in cosmetic formulations and will give or act with "environment activity" i.e., will acts in the conditions or situation where the activity is required (on human skin).

The protein matrix carrier is of biotechnologic vegetal origin instead of human or animal protein matrix and will enhanced the proteins and lipids / collagen requirements in "firming" the sagging aged skin.

Campo Research
Singapore

# CAMPO RESEARCH Pte Ltd
# TECHNICAL SPECIFICATION

| | |
|---|---|
| PRODUCT Name (Campo Research)<br>Other Trade Names (Campo Research) | CAMPO™ TOTAL APPLE'S ENZYMES EXTRACT<br>CAMPO™ MALUS FRUCTUS EXTRACT, APPLES EXTRACT |
| CTFA TRADE NAME<br>Existing CTFA / INCI Name | TOTAL APPLE'S ENZYMES EXTRACT<br>Malus domestica/Pyrus Malus (Apple ) Fruit Extract |
| Chinese Translation | 苹果（PYRUS MALUS）果提取物<br>苹果（MALUS DOMESTICA）果提取物<br>水 AQUA (WATER) |
| CAMPO PRODUCT #<br>HS Code: | **96.3750**<br>1302.19.0000 |
| CTFA Monograph ID | 8997 – Pyrus Malus (Apple) Fruit Extract<br>21160 – Malus Domestica Fruit Extract<br>9423 – Aqua |
| CAS #<br>CAS # EU | N/A – Pyrus Malus (Apple) Fruit Extract<br>85251-63-4 (EU) – Pyrus Malus Fruit Extract<br>89957-48-2 – Malus Domestica Fruit Extract<br>N/A (EU) – Malus Domestica Fruit Extract<br>7732-18-5 – Aqua (Water) |
| EINECS Number and Name<br>EINECS # EU | N/A – Pyrus Malus (Apple) Fruit Extract<br>286-475-7 (EU) – Pyrus Malus Fruit Extract<br>289-567-5 (1) – Malus Domestica Fruit Extract<br>N/A (EU) – Malus Domestica Fruit Extract<br>231-791-2(1) – Aqua (Water) |
| EINECS Number and Name<br>EINECS # EU<br>European Commission–Health & Consumer Cosmetics–Cosing | Pyrus Malus (Apple) Fruit Extract<br>http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=58863<br>Pyrus Malus Fruit Extract – 286-475-7 (EU)<br><br>Malus Domestica Fruit Extract<br>http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=83460<br>Malus Domestica Fruit Extract – N/A (EU)<br><br>Aqua (Water)<br>http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=31959<br>Aqua – 231-791-2 (EU) |
| BATCH/LOT # | **See COA Batch Lot** |
| SPECIES | Malus domestica<br>Syn: Pyrus Malus (Apple ) Fruit Extract |
| PARTS USED | Fructus |
| RAW MATERIAL - ORIGIN | Australia, New Zealand |
| CONCENTRATION | |
| COMMENTS | A Quality Management System, compliant to the International Standard ISO 9001,was used to manufacture and test this material<br><br>***Please take note that all specifications are liable to changes without prior notice.** |

| Specification Parameter Analysis | Specification Range | Results | Methods |
|---|---|---|---|
| Physical Form | Liquid | Conforms | Visual |
| Color | Light Yellowish Brown | Conforms | Visual |

| | | | |
|---|---|---|---|
| Odor | Characteristic Slight | Conforms | Olfactory |
| Specific Gravity (20deg.C) | 1.1100 - 1.3200 | See COA | USP XXIX / Paar. DMA46 |
| Refractive Index (20deg.C) | 1.350 - 1.450 | See COA | USP XXIX / DGF IV C (52) |
| pH(20deg.C.) (100% concentrate) | 6.50- 7.50 | See COA | USP XXIX / DGF H III (92) |
| Dry Residue (160deg.C/35Min) | 45% - 60% | See COA | Mettler 16J |
| Protein Matrix Content | - | See COA | |
| Nitrogen Content | - | See COA | |
| Sodium Content | - | See COA | |
| Water Solubility | Soluble | Conforms | |
| Viscosity @ 20deg.C(m PaS) | - | - | - |
| Saponification Value BS684 | - | | |
| Decomposition Point | - | | |
| Sulfated Ash Content | - | | |
| Preservation | None | | |
| Pesticide Content | None | | Pflanzaniaschuttal 1989 |
| Total Germs | <100 CFU/ml - non-pathogenic | Conforms | USP XXIX/Ph.Eur.2.6.12(97) |
| Total Yeast/Mold | <100 CFU/ml | Conforms | USP XXIX/Ph.Eur.2.6.12(97) |
| Heavy Metals(Total)As,Pb,Hg | <0.05 ppm | Conforms | USP XXIX/Ph.Eur.2.6.12(97) |

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# "(SAFETY DATA SHEET – compliant to GHS)" CONFIRMS TO EC DIRECTIVE 91/155/EEC, EC REGULATION NO#1272/2008, AMENDED EC REGULATION NO#790/2009 and Complies to The EU Cosmetic Products Regulation (Regulation (EC) No 1223/2009) effective on July 2013., and to EU Commission Regulation No.358/2014/9 of 9th April 2014 amending Annexes II and V, to EU Regulation No No.1223/2009 of The European Parliament and of The Council on Cosmetic products, (Effective Date 31st October 2014) AND to US DEPT.OF LABOR-Occupational Safety & Health Admin directives and compliant to Globally Harmonized System of Classification and Labeling of Chemicals (hereinafter referred to as "the GHS")., and Complies and Confirms to the Requirements of State of California Proposition 65.

A Quality Management System, compliant to the International Standard ISO 9001, was used to manufacture and test this material

http://www.osha.gov/dsg/hazcom/ghs.html

http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html

http://www.hc-sc.gc.ca/ahc-asc/intactiv/ghs-sgh/index-eng.php

| | |
|---|---|
| DATE OF FIRST ISSUE | February 10th 1996-Reviewer - Dr Balasubramaniam PhD |
| DATE OF LATEST REVISION | Dec. 19th 1996- Rev'wer- Dr Fergus Jes .G.Velasquez Bsc. Med Tech, MD **February 10th 2012 – Reviewer=Joshua Teo** February 5th 2013 – Reviewer = **Balasubramaniam M PhD** **12th February 2015 - Joshua Teo BSc. Chem, Balasubramaniam M PhD & Oksana Nemchenko MD** **15th May 2016 - Joshua Teo BSc. Chem, Balasubramaniam M PhD & Oksana Nemchenko MD** |
| 1 PRODUCT AND COMPANY IDENTIFICATION | |
| COMMERCIAL NAME: | **CAMPO™ TOTAL APPLE'S ENZYMES EXTRACT** |
| OTHER TRADE NAME: | APPLES/MALUS FRUCTUS EXTRACT/ PYRUS MALUS (APPLE) FRUIT EXTRACT |
| INCI NAME: | *Pyrus Malus (Apple ) Fruit Extract (AND) Malus Domestica Fruit Extract (AND) Water* |
| Chinese Translation | 苹果（PYRUS MALUS）果提取物<br>苹果（MALUS DOMESTICA）果提取物<br>水 AQUA (WATER) |
| **INTERNATIONAL CHEMICAL IDENTIFICATION** ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)and Compliant to the GHS*** | **PYRUS MALUS FRUIT (APPLE) EXTRACT MALUS DOMESTICA FUIT EXTRACT AQUA (WATER)** |
| FDA NAME | FRUIT EXTRACT |
| MANUFACTURER : | **CAMPO RESEARCH Pte Ltd** |

| | | |
|---|---|---|
| | (cGMP MFG. FACILITIES) : | **Hudson Industrial Bldg., #05-02, 14,New Industrial Road, Singapore 536203** |
| | EMERGENCY TELEPHONE NUMBERS: | (65)-63833631/(65)-63228503 (Singapore**)** |
| 2. | HAZARDS INDENTIFICATION | |
| | NOT CLASSIFIED AS DANGEROUS ACCORDING TO DIRECTIVE 67/548/EEC OR ITS AMENDMENTS. | DIVISION 1.6; NON-HAZARDOUS NO HAZARD STATEMENT |
| | **HAZARD CLASS and CATEGORY CODE(s)** | PICTOGRAM : NONE |
| | **HAZARD STATEMENT CODE(s)** ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)*** **and compliant to the GHS** | No GHS Pictogram (Totally Non-Hazardous) Division 1.6; NO HAZARD STATEMENT |
| | **GHS CLASSIFICATION :** This material is Non-hazardous according To UN-GHS Criteria. | PICTOGRAM : NONE No GHS Pictogram (Totally Non-Hazardous) Division 1.6: No Hazard Statement. |
| | **GHS LABEL ELEMENTS:** | No GHS Pictogram (Totally Non-Hazardous) Division 1.6: No Hazard Statement. |
| 3 | COMPOSITION / INFORMATION ON INGREDIENTS | |
| | **STANDARDIZED PLANT EXTRACT IN WATER** | Acid phosphatase, Alanine aminotransferase,α-amylase, Aldolase, Alkaline Phosphatase, Aspartate Aminotransferase, γ-Glutamyl Transpeptidase, α-Hydroxybutyrate Dehydrogenase, Leucine Aminopeptidase, Lipase, Phosphohexose Isomerase. |
| | CTFA Monograph ID | 8997 – Pyrus Malus (Apple) Fruit Extract<br>21160 – Malus Domestica Fruit Extract<br>9423 – Aqua |
| | CAS #<br>CAS # EU | N/A – Pyrus Malus (Apple) Fruit Extract<br>85251-63-4 (EU) – Pyrus Malus Fruit Extract<br>89957-48-2 – Malus Domestica Fruit Extract<br>N/A (EU) – Malus Domestica Fruit Extract<br>7732-18-5 – Aqua (Water) |
| | **CAS NO# (CAS Name)** ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)and compliant to the GHS*** | **85251-63-4 – Pyrus Malus Fruit Extract (EU)**<br>**7732-18-5 – Water (Aqua)** |
| | EINECS Name and Number<br>EINECS# EU | N/A – Pyrus Malus (Apple) Fruit Extract<br>286-475-7 (EU) – Pyrus Malus Fruit Extract<br>289-567-5 (1) – Malus Domestica Fruit Extract<br>N/A (EU) – Malus Domestica Fruit Extract<br>231-791-2(1) – Aqua (Water) |
| | **EINECS# (EINECS Name)** ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009) and compliant to the GHS*** | **286-475-7 – Pyrus Malus Fruit Extract (EU)**<br>**231-791-2(1) – Water (Aqua)** |
| | EINECS Name and Number<br>EINECS# EU<br>European Commission–Health & Consumer Cosmetics–Cosing | Pyrus Malus (Apple) Fruit Extract<br>http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=58863<br>Pyrus Malus Fruit Extract – 286-475-7 (EU)<br><br>Malus Domestica Fruit Extract<br>http://ec.europa.eu/consumers/cosmetics/cosing/index. |

| | | |
|---|---|---|
| | | cfm?fuseaction=search.details_v2&id=83460<br>Malus Domestica Fruit Extract – N/A (EU)<br><br>Aqua (Water)<br>http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=31959<br>Aqua – 231-791-2 (EU) |
| | RISK PHRASES<br>SAFETY PHRASES 25-26 | None<br>Not mandatory |
| | **GHS CLASSIFICATION :**<br>This material is Non-hazardous according To UN-GHS Criteria. | **PICTOGRAM : NONE** |
| | **GHS LABEL ELEMENTS:** | **No GHS Pictogram (Totally Non-Hazardous)**<br>**Division 1.6: No Hazard Statement.** |
| 4 | FIRST AID MEASURES | |
| | **EYE CONTACT:** | Irrigation of the eye immediately with flowing water for 5 minutes is a good safety practice. Seek medical advice, if irritation occur and persist. |
| | **ORAL INGESTATION:** | Essentially edible in small quantities |
| | **SKIN CONTACT:** | Contact will probably cause no more than a temporary slight irritation. Wash off in flowing water or shower. |
| 5 | FIRE FIGHTING MEASURERS | |
| | **COMBUSTIBLE BUT PRESENTS NO SPECIAL FIRE HAZARD.** | |
| | EXTINGUISHING MEDIA: | CO2, dry foam, dry chemical or skilled use of water spray. |
| | PROTECTIVE EQUIPMENTS FOR FIGHTERS: | Standard Equipments. |
| 6 | ACCIDENTAL RELEASE MEASURES | |
| | COVER WITH ABSORBENT MATERIAL (USE APPROPRIATE SAFETY EQUIPMENT) SOAK AND SWEEP INTO A DRUM. | |
| 7 | HANDLING AND STORAGE | |
| | STORE IN SEALED CONTAINERS UNDER NORMAL COOL, DRY WAREHOUSING CONDITIONS. | |
| 8 | EXPOSURE AND PERSONAL PROTECTION | |
| | IN ACCORDANCE WITH GOOD INDUSTRIAL PRACTICE AND HANDLING USING STANDARD EYE PROTECTION. | |
| 9 | PHYSICAL AND CHEMICAL PROPERTIES | |
| | PHYSICAL FORM: | Liquid |
| | COLOUR: | Light Yellowish Brown |
| | ODOUR: | Characteristic- slight |
| | BOILING POINT: | 90 deg. cent. |
| | MELTING POINT: | - |
| | VISCOSITY: | - |
| | FLASH POINT: | closed cup |
| | FLAMMABILITY SOLID/GAS: | N/A |
| | AUTO FLAMMABILITY: | N/A |
| | SPECIFIC REFRACTIVE: | 1.350 - 1.450 |
| | EXPLOSIVE PROPERTIES: | N/A |
| | pH: (100% Concentrate) | 6.50 – 7.50 |
| | OXIDIZING PROPERTIES: | N/A |
| | VAPOUR PRESSURE: | 0.90 |
| | DENSITY: (20 deg. Cent.) | 1.110 - 1.320 |
| | WATER SOLUBILITY: | COMPLETE |

| | | |
|---|---|---|
| | OTHER SOLUBILITY: | In most cosmetic solvents |
| | RESIDUE ON DRYING (160 deg C Mettler ): | 45-75 % |
| | PARTITION COEFFICIENT: (OCTANOL/WATER) | - |
| | EXPLOSIVE LIMITS: | - |
| 10 | STABILITY AND REACTIVITY | |
| | THERMAL DECOMPOSITION: | Stable under normal conditions of use |
| 11 | TOXICOLOGICAL DATA | Animal Tests Last Done 1992, as requirements of the then EC DIRECTIVE 91/155/EEC |
| | ORAL: | LD 50> 8,000 mg/kg (Body weight) Rat<br>Essentially Non-Toxic and Edible in Small Quantity.<br><br>Expected To Be Essentially Non Toxic |
| | DERMAL: | N/A |
| | INHALATION: | 8,000 MG/KG (Body Wt.); CATEGORY 5 |
| | **SPECIFIC CONCENTRATION LIMITS M-FACTORS *(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)* compliant to the GHS.** | Essentially Non-Toxic and Edible in Small Quantity. |
| | TOXIC EFFECTS: | |
| | SKIN: | Primarily Irritation Index (PII) = 0.0 ( Non- Irritating - Skintex ), Not a Primarily Irritant.<br>Non-irritant/ Non-sensitizer as per repeated patch insult test on 50 human volunteers<br><br>Human repeated patch test 48 hours:<br>50/50 completely non-irritating/ non-erythema causing ingredient at 100% concentrate in water on 50 human volunteers. |
| | EYE: | Very mild / minimal- not a transient conjunctival irritant at 10% concentrate in water (Eyetex Classification).<br><br>*Summarized toxicological data as shown here are formation bounded under Non-Disclosure Agreement with various clients as when these Toxicological Data were established or their exclusive uses.* |
| 12 | ECOLOGICAL INFORMATION | |
| | BIODEGRATION: | Expected to be ultimately biodegradable. |
| | FISH TOXICITY: | No data |
| | BACTERIAL & VIRAL TOXICITY: | No data |
| | WGK CLASS: | WGK (Self Classification) |
| 13 | DISPOSAL CONDITIONS | |
| | DISPOSE OFF ACCORDING TO A RECOGNISED METHOD OF CHEMICAL WASTE DISPOSAL. | |
| 14 | TRANSPORT INFORMATION | |
| | UN NUMBER# : | N/A |
| | UN NAME: | Not Assigned |
| | IMDG CODE/CLASS: | Not Hazardous |
| | IMDG CODE PAGE NO. | N/A |
| | ICAO/IATA AIR CLASS: | Non-Hazardous |
| | ICAO/IATA AIR CLASS PACKING GROUP: | N/A |
| | RID/ADR CLASS: | Non-Hazardous |
| | ADNR CLASS: | Non-Hazardous |
| | **LABELLING: *(EC REGULATION NO#1272/2008 AMENDED NO#790/2009) and compliant to*** | |

| | | |
|---|---|---|
| | ***the GHS.*** | |
| | **PICTOGRAM SIGNAL WORD CODE(s):** | No GHS Pictograms (Totally Non-Hazardous) |
| | **HAZARD STATEMENT CODE(s):** | Division 1.6; No Hazard Statement |
| | **SUPPLEMENTARY HAZARD STATEMENT CODE(s):** | Similar Division 1.6; No Hazard Statement |
| 15 | REGULATORY INFORMATION | |
| | OCCUPATIONAL EXPOSURE LIMITS: | N/A |
| | **U.S. State of California Proposition 65 INGREDIENTS Presence** | **None (Exempted from CA Prop 65 Register)** |
| | **EU Commission Regulation No.358/2014/9 of 9th April 2014 amending Annexes II and V, to EU Regulation No No.1223/2009 of The European Parliament and of The Council on Cosmetic products** | **"Contains No Parabens and nor contains any Branched Chain Parabens".**(EU Regulation No.358/2014/9 of 9th April 2014) |
| 16 | OTHER INFORMATION | |
| | USES AS A COSMETIC ADDITIVE | 1.0 - 5.0 % |
| | | *Please take note that all specifications are liable to changes without prior notice. |
| | Campo jtc ph | |

**Campo Total Apple's Enzymes Extract ©.** **© US. Library-of Congress 1989-2017 ©**

# ENZYME: EC 2.1.2.1

**Official Name:**
*GLYCINE HYDROXYMETHYLTRANSFERASE*

**Alternative Names:**
***SERINE HYDROXYMETHYLTRANSFERASE***
***SERINE ALDOLASE***
***THREONINE ALDOLASE***
***SERINE HYDROXYMETHYLASE***

**Reaction catalyzed:**

5,10- METHYLENETETRAHYDROFOLATE
\+ GLYCINE
\+ H (2) O
<= >TETRAHYDROFOLATE
\+ L-SERINE

**Co-factor(s):** PYRIDOXAL PHOSPHATE

**Comment(s):**

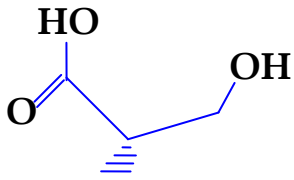
- ALSO CATALYSES THE REACTION OF GLYCINE WITH ACETALDEHYDE TO FORM L-THREONINE, AND WITH 4-TRIMETHYLAMMONIOBUTANAL TO FORM 3-HYDROXY-N6, N6, N6-TRIMETHYL-L-LYSINE.

**Cross Reference(s):**

- PROSITE: PDOC00090
- EMP/PUMA: 2.1.2.1
- KYOTO UNIVERSITY LIGAND CHEMICAL DATABASE: 2.1.2.1
- SWISS-PROT:

P34894, GLYA ACTAC; P39148, GLYA BACSU; P24060, GLYA BRAJA;
P24531, GLYA CAMJE; P00477, GLYA ECOLI; P43844, GLYA HAEIN;
P34895, GLYA HYPME; P47634, GLYA MYCGE; P06192, GLYA SALTY;
P34896, GLYC HUMAN; P34898, GLYC NEUCR; P07511, GLYC RABIT;
Q10104, GLYC SCHPO; P35623, GLYC SHEEP; P37291, GLYC YEAST;
P49357, GLYM FLAPR; P34897, GLYM HUMAN; P34899, GLYM PEA ;
P14519, GLYM RABIT; P37292, GLYM YEAST; P49358, GLYN FLAPR;

**ENTRY** C00065
**NAME** L-Serine
**FORMULA** C3H7NO3

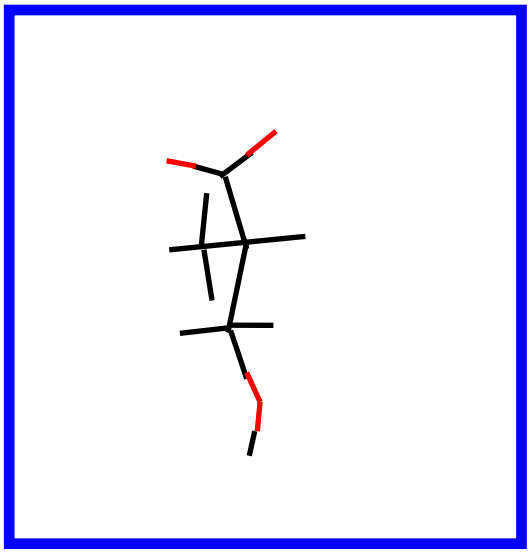


C00065

**DBLINKS CAS: 56-45-1**

**EC:** 1.4.1.7 1.5.1.17 2.1.2.1 2.3.1.30 2.3.1.50
2.6.1.44 2.6.1.45 2.6.1.51 2.6.1.58 2.7.1.80
2.7.8.4 2.7.8.8 2.8.1.4 3.1.3.3 3.2.1.110
3.5.1.61 4.2.1.13 4.2.1.16 4.2.1.20 4.2.1.22
4.2.1.50 6.1.1.11 6.3.2.14

## L-serine (KLM0000340)



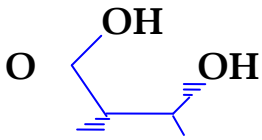
**Config Rule:**

config ('L-serine', [substituent (aminoacid_L_backbone), substituent (hydroxymethyl), linkage (from (aminoacid_L_ backbone, car (1) ), to (hydroxymethyl, car (1) ), down, single ) ] ).

%%%%% Substituent Config Rules for compound 'L-serine

config (aminoacid_L_backbone, [Left (amino), Right (hyd), Top (carboxyl), Center (car (1)]).

**ENTRY** **C00188**
**NAME** **L-Threonine**
**FORMULA C4H9NO3**



**C00188**

**DBLINKS CAS: 72**-19-5
**EC:** 1.1.1.103 1.5.1.17 2.1.2.1 4.1.2.5 4.2.1.16
4.2.99.2 5.1.1.6 6.1.1.3

# LinkDB Search Result

**Database: LinkDB**

Link Database
Release 96-06-22, Jun 96
Institute for Chemical Research, Kyoto University
2, 119, 344 entries

**COMPOUND : C00018 - RELATED ENTRIES ( Total 242 hits. ):**

| | Database | Entry | Link type |
|---|---|---|---|
| 1. | ENZYME | 1.1.1.65 | original |
| 2. | ENZYME | 1.4.3.5 | original |
| 3. | ENZYME | 1.4.4.2 | original |
| 4. | ENZYME | 2.1.2.1 | original |
| 5. | ENZYME | 2.1.2.5 | original |
| 6. | ENZYME | 2.1.2.6 | original |
| 7. | ENZYME | 2.3.1.29 | original |
| 8. | ENZYME | 2.3.1.37 | original |
| 9. | ENZYME | 2.3.1.47 | original |
| 10. | ENZYME | 2.3.1.50 | original |
| 11. | ENZYME | 2.4.1.1 | original |
| 12. | ENZYME | 2.6.1.1 | original |
| 13. | ENZYME | 2.6.1.10 | original |
| 14. | ENZYME | 2.6.1.11 | original |
| 15. | ENZYME | 2.6.1.12 | original |
| 16. | ENZYME | 2.6.1.13 | original |
| 17. | ENZYME | 2.6.1.14 | original |
| 18. | ENZYME | 2.6.1.15 | original |
| 19. | ENZYME | 2.6.1.17 | original |
| 20. | ENZYME | 2.6.1.18 | original |
| 21. | ENZYME | 2.6.1.19 | original |
| 22. | ENZYME | 2.6.1.2 | original |
| 23. | ENZYME | 2.6.1.20 | original |
| 24. | ENZYME | 2.6.1.21 | original |
| 25. | ENZYME | 2.6.1.24 | original |
| 26. | ENZYME | 2.6.1.25 | original |
| 27. | ENZYME | 2.6.1.26 | original |
| 28. | ENZYME | 2.6.1.27 | original |
| 29. | ENZYME | 2.6.1.3 | original |
| 30. | ENZYME | 2.6.1.33 | original |
| 31. | ENZYME | 2.6.1.34 | original |
| 32. | ENZYME | 2.6.1.35 | original |
| 33. | ENZYME | 2.6.1.36 | original |
| 34. | ENZYME | 2.6.1.37 | original |
| 35. | ENZYME | 2.6.1.39 | original |

## PROSITE: PDOC00090 (Documentation)

**{ PDOC00090 }**
**{ PS00096; SHMT }**
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

**Serine hydroxymethyltransferase pyridoxal - phosphate attachment site**
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Serine hydroxymethyltransferase (EC 2.1.2.1) (SHMT) [1] catalyzes the transfer of the hydroxymethyl group of serine to tetrahydrofolate to form 5-methylenetetrahydrofolate and glycine. In vertebrates, it exists in cytoplasmic and a mitochondrial form whereas only one form if found in prokaryotes. Serine hydroxymethyltransferase is a periodical-phosphate-containing enzyme. The pyridoxal-P group is attached to a lysine residue around which the sequence is highly conserved in all forms of the enzyme.

- Consensus pattern: [ST] (4) - H- K- [ST] - L - x - G - x - R [GSA] (2)
[ K is the pyridoxal-P attachment site]
- Sequences known to belong to this class detected by the pattern: ALL
- Other sequence(s) detected in SWISS-PROT: None
- Last update: June 1994 / Pattern and text revised.

[ 1 ] Usha R., Savithri H.S., Rao N. A.
Biochem. Biophys. Acta 1204: 75 83 ( 1994 ).

| | |
|---|---|
| **ENTRY** | EC 1.1.1.27 |
| **NAME** | L-Lactate dehydrogenate |
| | Lactic acid dehydrogenate |
| **CLASS** | Oxidoreductases |
| | Acting as the CH-OH group of donors |
| | With NAD+ or NADP+ as acceptor |
| **SYS NAME** | (S) Lactate NAD+ Oxidoreductase |
| **REACTION** | (S) - Lactate + NAD+ - Pyruvate + NADH |
| **SUBSTRATE** | (S) - Lactate |
| | (S) - 2 - Hydroxymonocarboxylic acid |
| | NAD+ |
| **PRODUCT** | Pyruvate |
| | NADH |
| **COMMENT** | Also oxidizes other (S)-2-hydroxy-monocarboxylic acids. |
| | NADP - also acts more slowly with the animal, but not the Bacterial enzyme |
| **PATHWAY** | PATH: MAP00010 Glycolysis / Gluconeogenesis |
| | PATH: MAP00260 Glycine, serine and threonine metabolism |
| | PATH: MAP00360 Phenylalanine and tyrosine metabolism (2) |
| | PATH: MAP00380 Tryptophan metabolism |

PATH: MAP00620 Pyruvate and acetyl-CoA metabolism
PATH: MAP00640 Propanoate metabolism

**DISEASE** MIM: 150000 Exertional myoglobinuria due to deficiency of LDH.

**MOTIF** PS: PS00064

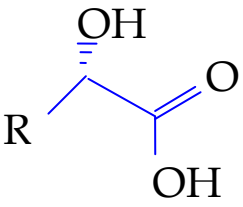
**DBLINKS** University of Geneva ENZYME DATA BANK: 1.1.1.27

PDB: 1HYH 1LDB 1LDM 1LDN 1LLC 1LLD 1LTH 2LDB 2LDX 3LDH 5LDH 6LDH 8LDH 9LDB 9LDT

**PIR:**

| | | | | | | |
|---|---|---|---|---|---|---|
| A20629 | A21986 | A23083 | A24999 | A25805 | A26053 | A32430 |
| A32957 | A36070 | A36957 | A37334 | A38231 | A40488 | A43598 |
| A45246 | A47180 | B27246 | B29704 | B32957 | B36070 | B40885 |
| C49904 | DEBSLF | DEBSLM | DECHLH | DECHLM | DEDFLM | DEHULC |
| DEHULH | DEHULM | DELBLA | DEMSLC | DEMSLM | DEPGLH | DEPGLM |
| G43868 | H64250 | JC2312 | JC2432 | JN0449 | JQ0183 | JQ2222 |
| JX0090 | PA0103 | S00019 | S06290 | S08182 | S08183 | S09954 |
| S12151 | S22492 | S33362 | S33453 | S36863 | S36864 | |

**ENTRY** **C04096**
**NAME** **(S) - 2 - Hydroxymonocarboxylic acid**




C04096

**DBLINKS** **EC: 1 . 1 . 1 . 27**

# ENZYME: EC 3.4.11.1

**Official Name:**
LEUCYL AMINOPEPTIDASE

**Alternative Name(s):**
*CYTOSOL AMINOPEPTIDASE*
*LEUCINE AMINOPEPTIDASE*
*PEPTIDASES*

**Reaction catalyzed:**
RELEASE OF AN N-TERMINAL AMINO ACID, XAA—XBB-, IN WHICH XAA IS PREFERABLY LEU, BUT MAY BE OTHER AMINO ACIDS INCLUDING PRO ALTHOUGH NOT ARG OR LYS, AND XBB MAY BE PRO.

**Cofactor(s):** ZINC

**Comment(s):**

- AMINO ACID AMIDES AND METHYL ESTERS ARE ALSO READILY HYDROLYSED, BUT RATES ON ARYLAMIDES ARE EXCEEDINGLY SLOW.
- IS ACTIVATED BY HEAVY METAL IONS.

**Cross-reference(s):**

- PROSITE: PDOC00548
- EMP/PUMA: 3.4.11.1
- KYOTO UNIVERSITY LIGAND CHEMICAL DATABASE: 3.4.11.1
- SWISS-PROT:

P11648, AMPA ECOLI; P45334, AMPA HAEIN; P30184, AMPL ARATH;
P00727, AMPL BOVIN; P28838, AMPL HUMAN; P47631, AMPL MYCGE;
P47707, AMPL MYCSA; P28839, AMPL PIG; P27888, AMPL RICPR;
P31427, AMPL SOLTU; P14904, AMPL YEAST;

# ENTRY EC 3.4.11.1

**NAME** Leucyl aminopeptidase
Leucine aminopeptidase
Leucyl peptidase
Peptidase S
Cytosol aminopeptidase

**CLASS** Hydrolases
Acting on peptide bonds (peptidases)
Aminopeptidases

**REACTION** Release of an N-terminal amino acid, Xaa + Xbb-, in which Xaa is preferably Leu, but may be other amino acids including Pro although not Arg or Lys, and Xbb may be Pro. Amino acid amides and methyl esters are also readily hydrolyzed, but rates on arylamides are exceedingly low.

**SUBSTRATE** Peptide
H2O

**PRODUCT** N-Terminal amino acid
Peptide

**INHIBITOR** Amastatin

**COFACTOR** Zinc

**EFFECTOR** Heavy metal ion

**COMMENT** A zinc enzyme isolated from pig kidney and cattle lens;
activated

By heavy metal ions formerly EC 3.4.1.1
Inhibited by Amastatin {H. Kim and W.N. Lipscomb, Biochemistry, 32, 8465-8478 (1993) }.

**MOTIF** PS: PS00631 N-T-D-A-E-G-R-L

**DBLINKS** University of Geneva ENZYME DATA BANK: 3.4.11.1
PDB: 1BLL 1BPM 1BPN 1LAM 1LAN 1LAP 1LCP
PIR: A33879 A40631 A42432 A48788 APBOL APECA PQ0470 PT0429 PT0430 PT0431 S22399

/ / /
DBGET integrated database retrieval system, GenomeNet (Kyoto Center)

# PROSITE: PDOC00548 (Documentation)

**{ PDOC00548 }**
**{ PS00631; CYTOSOL AP }**

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

## CYTOSOL AMINOPEPTIDASE

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Cytosol aminopeptidase is an eukaryotic cytosolic zinc-dependent exoptidase that catalyzes the removal of unsubstituted amino-acid residues from the N-terminus of proteins. This enzyme is often known as Lucien aminopeptidase (EC 3.4.11.1) (LAP) but has been shown [1] to be identical with prolyl aminopeptidase (EC 3.4.11.5). Cytosol aminopeptidase is a hexamer of identical chains, each of which binds two zinc ions.

Cytosol aminopeptidase is highly similar to Escherichia coli pepA, a manganese dependent aminopeptidase. Residues involved in zinc ion-binding [2] in the mammalian enzyme are absolutely conserved in pepA where they presumably bind manganese.

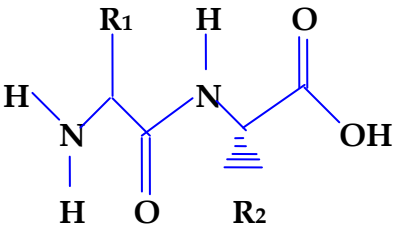
A cytosol aminopeptidase from Rickettsia prowazekki [3] and one from Arabidopsis thaliana belong to this family.

As a signature pattern for these enzymes, we selected a perfectly conserved octapeptide, which contains two residues involved in binding metal ions: an aspartate and a glutamate.

- Consensus pattern: N-T-D-A-E-G-R-L
  [ The D and the E are Zinc/ Manganese ligands]
- Sequences known to belong to this class detected by the pattern: ALL
- Other sequence (s) detected in SWISS-PROT: NONE.

- Note: these proteins belong to family M17 in the classification of peptidases [4,E1].

**ENTRY** **C00012**
**NAME** **peptide**



C0012

DBLINKS EC:

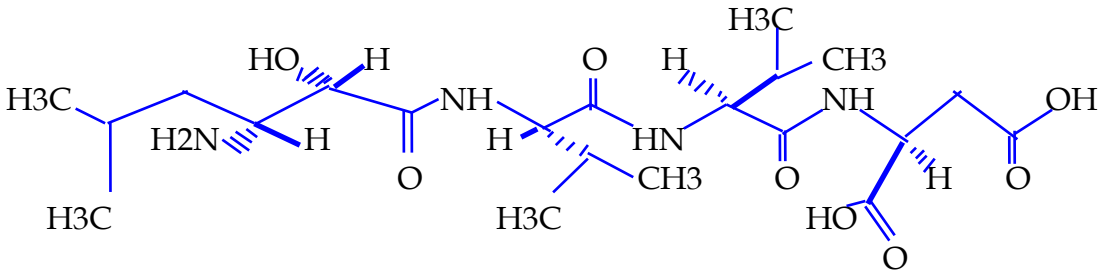
| | | | | |
|---|---|---|---|---|
| 2.3.1.88 | 2.3.2.2 | 3.4.11.1 | 3.4.11.2 | 3.4.11.5 |
| 3.4.11.7 | 3.4.11.9 | 3.4.11.10 | 3.4.11.12 | 3.4.11.13 |
| 3.4.11.14 | 3.4.11.15 | 3.4.11.16 | 3.4.11.17 | 3.4.11.18 |
| 3.4.14.1 | 3.4.14.4 | 3.4.14.5 | 3.4.14.9 | 3.4.15.1 |
| 3.4.15.4 | 3.4.16.1 | 3.4.16.2 | 3.4.16.4 | 3.4.17.1 |
| 3.4.17.2 | 3.4.17.3 | 3.4.17.4 | 3.4.17.6 | 3.4.17.10 |
| 3.4.17.11 | 3.4.17.12 | 3.4.17.15 | 3.4.17.16 | 3.4.17,17 |
| 3.4.17.18 | 3.4.17.19 | 3.4.18.1 | 3.4.19.1 | 3.4.19.2 |
| 3.4.19.3 | 3.4.19.5 | 3.4.19.7 | 3.4.19.9 | 3.4.19.10 |
| 3.4.21.1 | 3.4.21.2 | 3.4.21.3 | 3.4.21.4 | 3.4.21.5 |
| 3.4.21.6 | 3.4.21.7 | 3.4.21.10 | 3.4.21.12 | 3.4.21.13 |
| 3.4.21.14 | 3.4.21.15 | 3.4.21.16 | 3.4.21.17 | 3.4.21.18 |
| 3.4.21.19 | 3.4.21.20 | 3.4.21.25 | 3.4.21.26 | 3.4.21.32 |
| 3.4.21.36 | 3.4.21.37 | 3.4.21.39 | 3.4.21.40 | 3.4.21.43 |
| 3.4.21.44 | 3.4.21.47 | 3.4.21.49 | 3.4.21.50 | 3.4.21.51 |
| 3.4.21.52 | 3.4.21.53 | 3.4.21.57 | 3.4.21.58 | 3.4.21.59 |
| 3.4.21.61 | 3.4.21.62 | 3.4.21.63 | 3.4.21.64 | 3.4.21.65 |
| 3.4.21.66 | 3.4.21.67 | 3.4.21.69 | 3.4.21.70 | 3.4.21.71 |
| 3.4.21.72 | 3.4.22.1 | 3.4.22.2 | 3.4.22.3 | 3.4.22.4 |
| 3.4.22.5 | 3.4.22.6 | 3.4.22.7 | 3.4.22.8 | 3.4.22.10 |
| 3.4.22.11 | 3.4.22.12 | 3.4.22.13 | 3.4.22.14 | 3.4.22.15 |
| 3.4.22.16 | 3.4.22.17 | 3.4.22.24 | 3.4.22.25 | 3.4.22.27 |
| 3.4.22.30 | 3.4.22.31 | 3.4.22.32 | 3.4.22.33 | 3.4.22.34 |
| 3.4.22.35 | 3.4.22.36 | 3.4.22.37 | 3.4.23.1 | 3.4.23.3 |
| 3.4.23.4 | 3.4.23.5 | 3.4.23.12 | 3.4.23.13 | 3.4.23.14 |
| 3.4.23.16 | 3.4.23.17 | 3.4.23.18 | 3.4.23.19 | 3.4.23.20 |
| 3.4.23.21 | 3.4.23.22 | 3.4.23.23 | 3.4.23.24 | 3.4.23.25 |
| 3.4.23.26 | 3.4.23.27 | 3.4.23.28 | 3.4.23.29 | 3.4.23.30 |
| 3.4.23.31 | 3.4.23.32 | 3.4.23.33 | 3.4.23.34 | 3.4.23.35 |
| 3.4.23.36 | 3.4.23.37 | 3.4.23.38 | 3.4.23.39 | 3.4.24.1 |
| 3.4.24.3 | 3.4.24.4 | 3.4.24.5 | 3.4.24.6 | 3.4.24.7 |
| 3.4.24.11 | 3.4.24.12 | 3.4.24.14 | 3.4.24.15 | 3.4.24.16 |
| 3.4.24.17 | 3.4.24.18 | 3.4.24.19 | 3.4.24.20 | 3.4.24.21 |
| 3.4.24.22 | 3.4.24.23 | 3.4.24.24 | 3.4.24.25 | 3.4.24.26 |
| 3.4.24.27 | 3.4.24.28 | 3.4.24.29 | 3.4.24.30 | 3.4.24.31 |
| 3.4.24.32 | 3.4.24.33 | 3.4.24.34 | 3.4.24.35 | 3.4.24.36 |
| 3.4.24.37 | 3.4.24.38 | 3.4.24.39 | 3.4.24.40 | 3.4.24.41 |
| 3.4.24.42 | 3.4.24.43 | 3.4.24.44 | 3.4.24.45 | 3.4.24.46 |

| | | | | |
|---|---|---|---|---|
| 3.4.24.47 | 3.4.24.48 | 3.4.24.49 | 3.4.24.50 | 3.4.24.51 |
| 3.4.24.52 | 3.4.24.53 | 3.4.24.54 | 3.4.99.36 | 3.4.99.37 |
| 3.4.99.38 | 3.4.99.39 | 3.4.99.40 | 3.4.99.41 | 3.4.99.42 |
| 3.4.99.44 | 3.4.99.45 | 3.4.99.46 | 3.5.1.52 | |

/ / /

DBGET integrated database retrieval system, GenomeNet (Kyoto center)

**ENTRY** **C01552**
**NAME** Amastatin
**FORMULA** C21 H38 N4 O8




C01552

**DBLINKS** CAS: 67655-94-1
EC: 3.4.11.1

**ENTRY** **C00038**
**NAME** **Zinc**
**Zn 2+**
**FORMULA** **Zn**

# Zn

**C00038**

**DBLINKS** **CAS: 7440-66-6**

# ENZYME: EC 3.1.1.3

**Official Name:**
TRIACYLGLYCEROL LIPASE

**Alternative Name(s):**
*LIPASE*
*TRIGLYCERIDE LIPASE*
*TRIBUTYRASE*

**Reaction catalyzed:**

TRIACYLGLYCEROL
\+ H(2)O
< = > DIACYLGLYCEROL
\+ A FATTY ACID ANION

**Comment(s):**

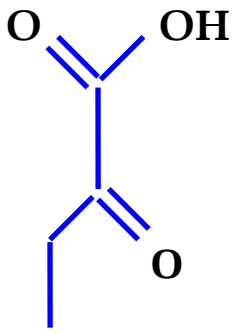
- THE PANCREATIC ENZYME ACTS ONLY ON AN ESTER-WATER INTERFACE; THE OUTER ESTER LINKS ARE PREFERENTIALLY HYDROLYSED

**Human Genetic Disease(s):**
HEPATIC LIPASE DEFICIENCY; MIM: 15670
CONGENITAL LIPASE DEFICIENCY; MIM: 246600
WOLMAN DISEASE; MIM: 278000.

**cross-reference(s):**

- PROSITE: PDOC00110, PDOC00112.
- EMP / PUMA: 3.1.1.3
- KYOTO UNIVERSITY LIGAND CHEMICAL DATABASE: **3.1.1.3**
- SWISS-PROT

**ENTRY** **C00165**
**NAME** **Diacylglycerol**
**FORMULA** **C3H4O4**



**C00165**

**DBLINKS** **EC:** **2.3.1.22** **2.3.1.73** **2.3.1.77** **2.4.1.184** **3.1.1.3**
**3.1.1.34** **3.1.4.10** **3.1.4.11**

**PROSITE: PDOC00110 ( Documentation )**

**{ PDOC00110 }**
**{ PS00120; LIPASE SER}**
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

# Lipase's, serine active site

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Triglyceride lipases (EC3.1.1.3) [1] are li[polytic enzymes that hydrolyzes the ester bondof triglycerides. Lipases are widely distributed in animals, plants and prokaryotes. In higher vertebrates there are at least three tissue-specific isozymes : pancreatic, hepatic, and gastric / lingual. These three types of lipases are closely related to each other as well as to lipoprotein lipase (EC 3.1.1.34) [2], which hydrolyzes triglycerides of chylomicrons and very low-density lipoproteins (VLDL).

The most conserved region in all these proteins is centered around a serine residue which has been shown [3] to participate, with an histidine and an aspartic acid residue, to a charge relay system. Such a region is also present in lipases of prokaryotic origin and in lecithin-cholesterol acyltransferase (EC 2.3.1.43) (LCAT) [4], which catalyzes fatty acid transfer between phosphatidylcholine and cholesterol. We have built a pattern from that region.

- Consensus pattern : [LIV] -x- [IVFY]- [LIVST] -G- [HYWV] -S-x-G- [GSTAC]
  [ S is the active site residue]
- Sequences known to belong to this class detected by the pattern : ALL.

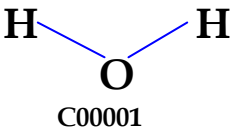
- Other sequence(s) detected in SWISS-PROT: 16.
- Note: Drosophila vittellogenins are also related to lipases [5], but they have lost their active site serine

| | |
|---|---|
| **ENTRY** | **EC 3.1.1.34** |
| **NAME** | Lipoprotein lipase<br>Clearing factor lipase<br>Diglyceride lipase |
| **CLASS** | Hydrolyses<br>Acting on ester bonds<br>Carboxylic ester hydrolyses |
| **SYSNAME** | Triglycero-protein acylhydrolase |
| **REACTION** | Triacylglycerol + water = Diacylglycerol + a- carboxylate |
| **SUBSTRATE** | Triacylglycerol<br>Water |
| **PRODUCT** | Diacylglycerol<br>Carboxylate |
| **COMMENT** | Hydrolyses triacylglycerols in chylomicrons and low-density lipoproteins Also hydrolyses diacylglycerol. |
| **DISEASE** | MIM: 238600 Hyperlipoproteinemia I |
| **MOTIF** | PS: PS00120 [LIV]-X-[LIVFY]- [LIVST]-G- [HYWV]-S-x-G-[GSTAC] |
| **DBLINKS** | University of Geneva ENZYME DATA BANK: **3.1.1.34** |

## Triacylglycerol Related Enzymes
**( Total 4 listed )**

1. **2.3.1.20** Diacylglycerol O-acyltransferase
2. **2.3.1.77** Triacylglycerol—sterol O-acyltransferase
3. **3.1.1.3** Triacylglycerol lipase
4. **3.1.1.34** Lipoprotein lipase

**ENTRY** **C00001**
**NAME** **H2O**
**Water**
**FORMULA** **H2O**



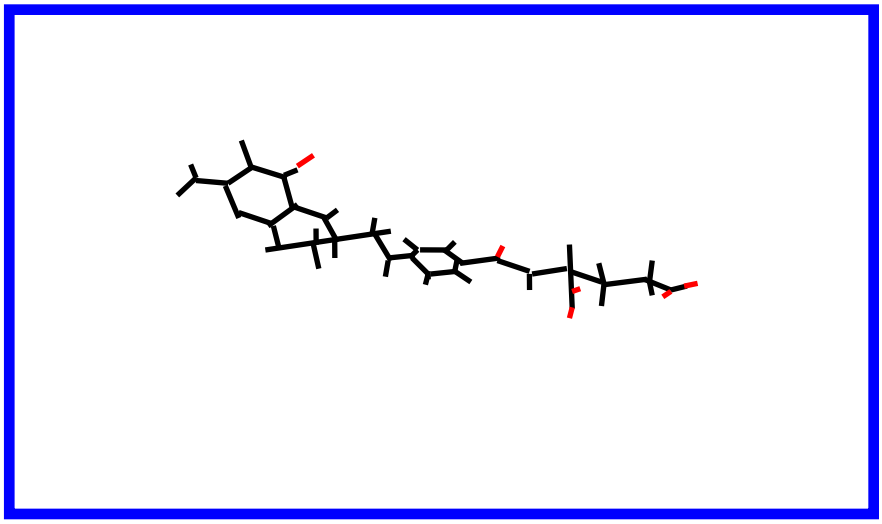
**C00001**

**DBLINKS** **CAS: 7732-18-5**

**ENTRY** **EC 2.1.2.1**
**NAME** Glycine hydroxymethyltransferase
Serine aldolase
Threonine aldolase
Serine hydroxymethylase
**CLASS** Transverses
Transferring one-carbon groups
Hydroxymethyl-, formyl- and related transverses
**SYSNAME** 5,10- Methylenetetrahydrofolate : glycine hydroxymethyltransferase
**REACTION** 5,10- Methylenetetrahydrofolate + Glycine + H2O = Tetrahydrofolate + L- Serine
**SUBSTRATE** 5,10- Methylenetetrahydrofolate
Acetaldehyde
4-Trimethylammoniobutanal
Glycine
H2O
**PRODUCT** Tetrahydrofolate
L-Serine
L-Threonine
3-hydroxy-N6, N6-trimethyl-L-lysine
**COFACTOR** Pyridoxal phosphate
**COMMENT** A pyridoxal-phosphate protein. Also catalyses the reaction of glycine with acetaldehyde to form L-threonine, and with 4-trimethylammonio-
butanal to form 3-hydroxy-N6, N6,N6-trimethyl-L-lysine.
**PATHWAY** PATH: MAP00260 Glycine, serine and threonine metabolism
PATH: MAP00460 Cyanoamino acid metabolism
PATH: MAP00670 One carbon pool by folate
PATH: MAP00680 Methane metabolism
PATH: MAP00700 Glyoxylate cycle
PATH: MAP00750 Vitamin B6 metabolism
**MOTIF** PS: PS00096 [ST] (4) -H-K-[ST]-L-x-G-x-R- [GSA] (2)
**DBLINKS** University of Geneva ENZYME DATA BANK: 2.1.2.1
PIR:
A33696 A40202 A42241 A46746 A56662 B46746 B48427

B53525 JQ1016 S15203 S29348 S34379 S40212 S40213 S40218 S61632 XYECS XYRBSC

# Tetrahydrofolate (KLM0000566)



**Synonyms:**

- 'tetrahydrofolic acid'
- tetrehydrofolic_acid
- 'THF'

**Confide Rule :**

```
confide (tetrahydrofolate, [
        substituent ( '1-benzoyl-4-yl" ) ,
        substituent ( 'pteridin-N10-yl') ,
        substituent ( 'D-glutamate' ( 1, peptide, end) ) ,
        linkage ( from ( 'pteridin-N10-yl', nit (10) ) ,
                to ( '1-benzoyl-4-yl", car (4) ) ,
                right, single ) ,
        linkage ( from ( '1-benzoyl-4-yl', car (7) ) ,
```

# ENZYME : EC 3.2.1.1

**Official Name:**
ALPHA-AMYLASE

**Alternative Name(s):**
*1,4- ALPHA-D-GLUCAN GLUCANOHYDROLASE.*

**Reaction catalyzed:**
ENDOHYDROLYSIS OF 1,4-ALPHA-GLUCOSIDIC LINKAGES IN OLIGOSACCHARIDES AND POLYSACCHARIDES.

**Comment(s):**

- ACTS ON STARCH, GLYCOGEN AND RELATED POLYSACCHARIDES AND OLIGOSACCHARIDES IN A RANDOM MANNER; REDUCING GROUPS ARE LIBERATED IN THE ALPHA-CONFIGURATION.

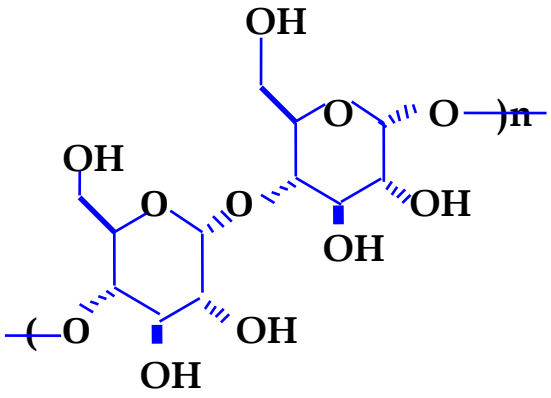
**cross-reference(s):**

- EMP / PUMA: 3.2.1.1
- KYOTO UNIVERSITY LIGAND CHEMICAL DATABASE: **3.2.1.1**
- SWISS-PROT

| | | | | | |
|---|---|---|---|---|---|
| P27935, | AM2A_ORYSA; | P27932, | AM3A_ORYSA; | P27937, | AM3B_ORYSA; |
| P27939, | AM3C_ORYSA; | P27933, | AM3D_ORYSA; | P27934, | AM3E ORYSA; |
| P72940, | AMC1_ORYSA; | P97941, | AMC2_ORYSA; | P22630, | AMY1_AERHY; |
| PO9961, | AMY1_DICTH; | P25718, | AMY1_ECOLI; | P00693, | AMY1_HORVU; |
| P17654, | AMY1_DICTH; | P21567, | AMY1_SACFI; | P19269, | AMY1_SCHOC; |
| Q09840, | AMY1_SCHPO; | P14898, | AMY2_DICTH; | P26612, | AMY2_ECOLI; |
| P04063, | AMY2_HORVU; | P26613, | AMY2_SALTY; | P14899, | AMY3_DICTH; |
| P04747, | AMY3_HORVU; | P08117, | AMY3_WHEAT; | P04748, | AMY4_HORVU; |
| P04749, | AMY5_HORVU; | P04750, | AMY6_HORVU; | P41131, | AMYA_AERHY |
| P10529, | AMYA ASPOR; | P08144, | AMYA_DROME; | P17859, | AMYA_VIGMU; |
| P21543, | AMYB_BACOP; | P19961; | AMYC HUMAN; | P04746, | AMYP HUMAN; |
| P00688, | AMYP_MOUSE; | P00690, | AMYP_PIG; | P00689′ | AMYP_RAT; |
| P17692, | AMYR BACS8; | P04745, | AMYS HUMAN; | P00687, | AMYP RAT ; |
| P29957, | AMY_ALTHA; | P30292, | AMY_ASPSH_; | P00692, | AMY_BACAM ; |
| P08137, | AMY_BACCI, | P06278, | AMY_BACLI, | P20845, | AMY BACME ; |
| P06279, | AMY_BACST_; | P00691, | AMY_BACSU, | P30269, | AMY_BUTFI ; |
| P23671, | AMY_CLOAB ; | P49274, | AMY DERPT ; | P49067, | AMY PURFU; |
| P30270, | AMY STRGR ; | P08486, | AMY STRHY ; | Q05884, | AMY STRLI; |
| P09794, | AMY STRLM; | P27350, | AMY STRTL; | P22998, | AMY_STRVL ; |
| P29750, | AMY TECU; | P26828, | AMY THETU; | P09107, | AMY_TRICA; |
| P38939, | APU_THEET ; | P36905, | APU THESA; | P38536, | APU THETU ; |
| P16950, | APU THETY; | | | | |

**ENTRY** C00930

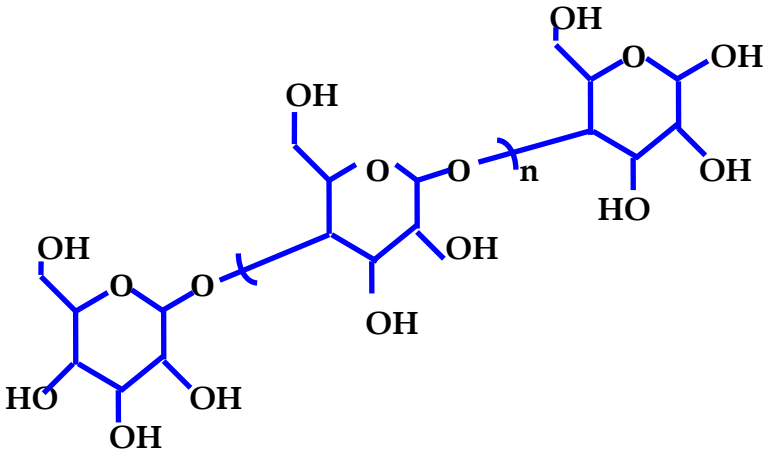
**NAME** Oligosaccharide




C00930

**DBLINKS** EC: 3.2.1.1 3.2.1.123
///

**ENTRY** C00420
**NAME** Polysaccharide

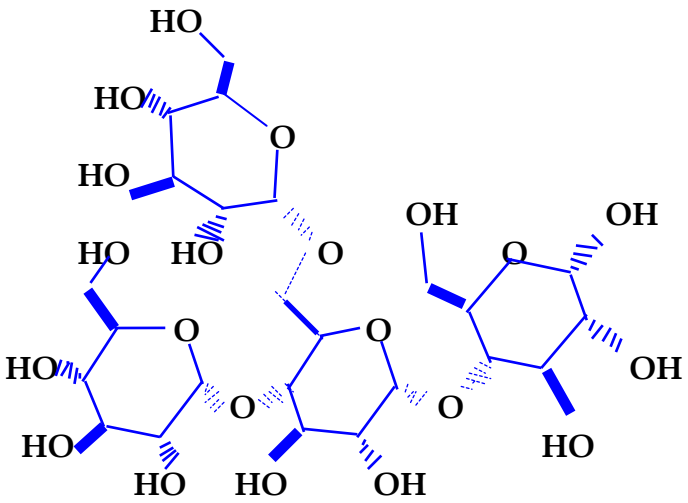



C00420

**DBLINKS** EC: 3.2.1.1 3.2.1.2 3.2.1.3 3.2.1.94

| | |
|---|---|
| **ENTRY** | **EC 3.2.1.1** |
| **NAME** | alpha-Amylase<br>Glycogenase |
| **CLASS** | Hydrolases<br>Glycosidases<br>Hydrolyzing O-glycosyl compounds |
| **SYSNAME** | 1,4-alpha-D-Glucan glucanohydrolase |
| **REACTION** | Endohydrolysis of 1,4-alpha-D-glucosidic linkages in polysaccharides containing three or more 1,4-alpha-linked D-glucose units |
| **SUBSTRATE** | Starch<br>Glycogen<br>Water<br>Polysaccharides |
| **PRODUCT** | Oligosaccharides |
| **COMMENT** | Acts on starch, glycogen and related polysaccharides and oligosaccharides in a random manner; reducing groups are liberated in the alpha-configuration. |
| **PATHWAY** | PATH: MAP00500 Starch and sucrose metabolism |
| **MOTIF** | PS : PS00506<br>PS : PS00679<br>PS : PS01072 |
| **DBLINKS** | University of Geneva ENZYME data bank: **3.2.1.1** |

**ENTRY** C00182
**NAME** Glycogen



C00182

**DBLINKS** EC 2.4.1.18 2.4.1.161 3.2.1.1 3.2.1.2 3.2.1.3 3.2.1.33 3.2.1.41 3.2.1.68

**DBGET** integrated database retrieval system, GenomeNet (Kyoto Centre)

# ENZYME: EC 2.6.1.1

**Official Name:**
ASPARTATE AMINOTRANSFERASE.

**Alternative Name (s):**
*TRANSAMINASE A.*
*GLUTAMIC-OXALOACETIC TRANSAMINASE.*

**Reaction catalyzed:**
L- ASPARTATE
- 2- OXOGLUTARATE
< > OXALOACETATE
L-GLUTAMATE

**Cofactor(s)** : PYRIDOXAL-PHOSPHATE

**Comment(s):**
- ALSO ACTS ON L-TYROSINE, L-PHENYLALANINE AND L-TRYPTOPHAN. THIS ACTIVITY CAN BE FORMED FROM EC 2.6.1.57 BY CONTROLLED PROTEOLYSIS.

**cross-reference(s):**

- PROSITE : **PDOC00098**
- EMP/PUMA : **2.6.1.1**
- KYOTO UNIVERSITY LIGAND CHEMICAL DATABASE: **2.6.1.1.**
- SWISS-PROT:

| | | | | | |
|---|---|---|---|---|---|
| P46643, | AAT1 ARATH ; | P28011, | AAT1 MEDSA ; | P46645, | AAT2 ARATH ; |
| P46644, | AAT3 ARATH ; | P46646, | AAT4 ARATH ; | Q02635, | AATA RHIME , |
| Q06191, | AATB RHIME ; | P33097, | AATC BOVINE ; | P00504, | AATC CHICK ; |
| P28734 | AATC DAUCA; | P08906, | AATC HORSE ; | P17174, | AATC HUMAN; |
| P05201, | AATC MOUSE ; | P37833, | AATC ORYSA ; | P00503, | AATC PIG ; |
| P12343, | AATC RABIT ; | P13221, | AATC RAT ; | P23542, | AATC YEAST ; |
| P46248, | AATM ARATH; | P12344, | AATM BOVIN ; | P00508, | AATM CHICK ; |
| P08907, | AATM HORSE ; | P00505, | AATM HUMAN; | P26563, | AATM LUPAN ; |
| P05202, | AATM MOUSE; | P00506, | AATM PIG ; | P12345, | AATM RABIT ; |
| P00507, | AATM RAT ; | Q01802, | AATM YEAST ; | P23034, | AAT BACSP ; |
| P39643, | AAT BAQCSU ; | P00509, | AAT ECOLI ; | P44425, | AAT HAEIN ; |
| P36692, | AAT STRGR ; | P14909, | AAT SULSO ; | | |

# PROSITE: PDOC0098 (documentation)

{PDOC00098}
{PS00105; AA TRANSFER CLASS1}

**********

## Aminotransferases class-I pyridoxal-phosphate attachment site

**********

Aminotransferases share certain mechanistic features with other pyridoxal phosphate dependent enzymes, such as the covalent binding of the pyridoxal phosphate group to a lysine residue. On the basis of sequence similar these various enzymes can be grouped [1,2] into subfamilies. One of the called class-I, currently consists of the following enzymes:

- ***Aspartate aminotransferase (AAT) (EC 2.6.1.1).*** AAT catalyzes the reversible transfer of the amino group from L-aspartate to 2-oxoglutarate to form oxaloacetate and L-glutamate. In eukaryotes, there are two AAT isozyme: one is located in the mitochondrial matrix, the second is cytoplasmic. In prokaryotes, only one form of AAT is found (gene aspC).
- ***Tyrosine aminotransferase (EC 2.6.1.5)*** which catalyzes the first step in tyrosine catabolism by reversibly transferring its amino group to oxoglutarate forming 4-Hydroxyphenylpyruvate and L-glutamate.
- ***Aromatic aminotransferase (EC 2.6.1.57)*** involved in the synthesis of Try, Asp and Leu (gene tyrB).
- ***1-aminocyclopropane-1-carboxylate syntheses (EC 4.4.1.14)*** (ACC syntheses) from plants. ACC syntheses catalyze the first step in ethylene biosynthesis.
- Pseudomonas denitrificans cob, which is involved in cobalamine biosynthesis
- Yeast hypothetical protein YJL060w.

The sequence around the pyridoxal-phosphate attachment site of this class enzyme is sufficiently conserved to allow the creation of a specific pattern.

- Consensus pattern: [GS]-[LIVMFYTAC]- [GSTA]-K-X(2)-[GSALVN]-LIVMFA]-X-[GNZ
  X-R-[LIVMA]-[GA]
  [k is the pyridoxal-pyridoxal-p attachment site]
- sequences known to belong to this class detected by the pattern: ALL.
- Other sequence(s) detected in SWISS-PROT: NONE.
- Last update: November 1995 / pattern and text revised.

[1] Bairoch A.
Unpublished observations (1992).
[2] Sung M. A , Tanizawa k., Tanaka H., Kurmitsu S., Kagmiyama H.,
Hirotsu K., Okamoto A., Higuchi T., soda K..
J. Biol. Chem. 266:2567-2572 (1991)..

# ENZYME : EC 4. 4. 1. 14

**Official Name:**
1-AMINOCYCLOPROPANE-1-CARBOXYLATE SYNTHASE

**Sysname(s):**
*S-ADENOSYL-L-METHIONINE METHYLTHIOADENOSINE-LYASE*

**Co-factor(s):**
PYRIDOXAL PHOSPHATE

**Comment(s):**
- A PYRIDOXAL-PHOSPHATE PROTEIN. THE ENZYME CATALYSES AN ALPHA, GAMMA-ELIMINATION.

**Reaction:**
- S-ADENOSYL-L-METHIONINE = 1-AMINOCYCLOPROPANE-1-CARBOXYLATE + METHYLTHIOADENOSINE

**Substrate:** S-ADENOSYL-L-METHIONINE

**Product:** 1-AMINOCYCLOPROPANE-1-CARBOXYLATE; METHYLTHIOADENOSINE

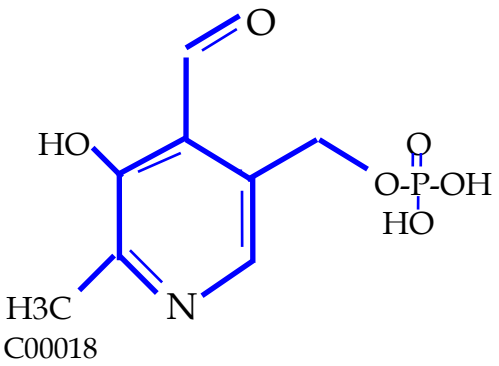
**Pathway:**
PATH: MAP00640 PROPANOATE METABOLISM

**Class:**
LYASES; CARBON-SULFUR LYASES.

**Motif:**
PS: PS00105 [GS] - [ LIVMFYTAC] - [GSTA] - K - x(2) - [GSALVN] - [LIVMFA] - x - [GNAR] - x - R - [LIVMA] - [GA]

**DBLINKS:**
UNIVERSITY OF GENEVA ENZYME DATA BANK: 4.4.1.14

**ENTRY** C00018
**NAME** PYRIDOXAL PHOSPHATE
**FORMULA** C8H10NO6P



C00018

**DBLINKS** CAS: 54-47-7

# PROSITE; PDOC00011 (documentation)

{ PDOC00011}
{PS00011; GLU CARBOXYLATION}
**********

# Vitamin K-dependent carboxylation domain

**********

Vitamin K-dependent carboxylation [1,2] is the post-translational modification of glutamic residues to form gamma-carboxyglutamate (Gla). Proteins known contain Gla are listed below.

*- A number of plasma proteins involved in blood coagulation. These proteins are prothrombin coagulation factors VII, IX and X, proteins C, S.*
*-Two proteins that occur in calcified tissues: osteocalcin (also known as bone-Gla protein, BGP ) and matrix Gla-protein (MGP).*
*-Cone snail venom peptides: conantokin-G and -T , and conotoxin GS [3].*

With the exception of the snail toxins, all these proteins contain N- terminal module of about forty amino acids where the majority of the residues are carboxylated . This domain is responsible for the high-affinity of Calcium ions. The Gla-domain starts at the N-terminal extremity of the mature form of these proteins and ends with a conserved aromatic residue a conserved Gla-x (3) - Gla-x Cys motif [4] is found in the middle of the domain, which seems to be important for substrate recognition by the carboxylase.

▹ Consensus pattern: x (12) -E -x(3)-E-x -C-x (6) -[DEN] -x-[LIVMFY] -x(9)- [FYW]
▹ Sequences known to belong to this class detected by the pattern: ALL.
▹ Other sequence(s) detected in SWISS-PROT : 5.

- Note: all glutamic residues present in the domain are potential carboxylation sites; in coagulation proteins, all are modified to Gla, while in BGP and MGP some are not.

-Expert (s) to contact by e-mail:
Price P.A : pprice @ucsd.edu
-Last update: December 1992/ Text revised

[1] Friedman P.A., Przysiecki C.T.
Int j. Biochem19: -7 (1987).
[2] Vermeer C.
Biochem. J. 266:625-636 (1990)
[3] Haack J.A., Rivier J.E., .Parks T.N ., Mena E.E., Cruz L. j., Olivera B.1,
J. Biol. Chem. 265: 6025-6029 (1990)
[4] Price P.A ., Fraser J.D., Metz- Virca G.
Proc. Nat'l. Acad Sci. U.S.A. 84:8335-8339(1987)

# LinkDB Search Result

**Database: LinkDB**

Link Database
Release 96-06-22, Jun 96
Institute for Chemical Research, Kyoto University
2, 119, 344 entries

**COMPOUND : C00182-related entries (Total 16 hits.):**

| | Database | Entry | Link type |
|---|---|---|---|
| 1 | ENZYME | 2.4.1.161 | original |
| 2 | ENZYME | 2.4.1.18 | original |
| 3 | ENZYME | 3.2.1.1 | original |
| 4 | ENZYME | 3.2.1.2 | original |
| 5 | ENZYME | 3.2.1.3 | original |
| 6 | ENZYME | 3.2.1.33 | original |
| 7 | ENZYME | 3.2.1.41 | original |
| 8 | ENZYME | 3.2.1.68 | original |
| 9 | LIGAND | 2.4.1.161 | reverse |
| 10 | LIGAND | 2.4.1.18 | reverse |
| 11 | LIGAND | 3.2.1.1 | reverse |
| 12 | LIGAND | 3.2.1.2 | reverse |
| 13 | LIGAND | 3.2.1.3 | reverse |
| 14 | LIGAND | 3.2.1.33 | reverse |
| 15 | LIGAND | 3.2.1.41 | reverse |
| 16 | LIGAND | 3.2.1.68 | reverse |

DBGET integrated database retrieval system, GenomeNet (Kyoto Centre)

# THE ROLE OF ENZYMES IN NUTRITION

In 1932, Dr. Edward Howell, physician and researcher, discovered that all food in its fresh, raw state contains its own enzymes, which are able to digest raw food and deliver its nutrients. Dr. Howell's research further revealed that a dramatic improvement in health and longevity is attained when food " self-digests ", using its own naturally occurring enzymes. Unfortunately, this is only possible when food is eaten raw, since cooking destroys enzymes.

In 1947, Dr William Hanson developed and patented the technology to extract plant and specific animal enzymes, which when added to the diet, have a unique ability to provide the same digestive activity as food enzymes in the human digestive tract. In addition to digestive assistance, these glandular extracts allow specific nutrients to be directed into specific human glands and organs, since the enzymes of bovine ( cow), match identically, to those of the corresponding human organ or gland. Afire example is when we consume a Vitamin C called Adrenucleo, this nutrient goes directly to our adrenalglands. The adrenal glands are known as the stress or fatigue glands, collagen production, insulin resistance and more.

## ENZYMES, THE SPARK OF LIFE

We are born because of enzymes and we die without them. Millions of enzymes are active in the body at all times, causing every chemical action and reaction including senses of sight, sound, thought, touch, digestion and cellular duplication. Our entire immune function relies on enzyme activity. Digestion in particular, the basis of immunity, relies upon specific enzymes secreted by cells in the digestive tract and pancreas, so as to release valuable nutrients from your food.

Nature has endowed all foods in their natural, uncooked form with enzymes to digest the protein, fiber, fat and carbohydrates in the food. Nutritional enzyme supplements taken with each meal will add to your body's enzyme supply.

## BECAUSE YOU EAT COOKED FOOD YOU NEED ENZYMES

When enzymes are missing from your food, the full burden of digestion, falls on your own digestive system. Nutritional enzymes can provide the same type of digestive activity as raw food enzymes. today's typical diet of cooked, canned and convenience foods make it very important to take supplemental nutritional enzymes to relieve some of your body's digestive stress.

## A WELL BALANCED DIET PLUS VITAMIN SUPPLEMENTS ARE NOT ENOUGH.
## ENZYMES ARE ESSENTIAL.

You can eat the most nutritious foods and take the best vitamin and mineral supplements, but if you do not digest and absorb what you consume, you will not realize optimal health benefits. Even if you include raw food in your diet, most raw

foods contain only enough enzymes to aid in their own digestion, with none left for the cooked foods in your diet.

Vitamins and minerals must team up with enzymes to perform the body's basic functions. There is clinical evidence that nutritional enzymes can enhance the nutritional value of dietary supplements containing vitamins, minerals, herbs and whole food concentrates. If you are not experiencing the benefits you expected from you dietary supplements, you will want to add nutritional enzymes to your diet.

**LIFE'S DEMANDS DEPLETE YOUR ENZYMES**

Cooked and processed food, caffeinated and alcoholic beverages, colds and fever, pregnancy, stress strenuous exercise and extreme weather conditions, are just a few of the things that use up your enzymes daily. Adding nutritional enzymes to your diet enables you to bring this constant drain on your valuable enzyme supply under control.

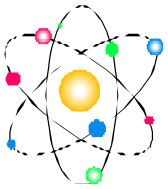
**A LACK OF ENZYMES IN YOUR DIET, ROBS YOUR IMMUNE SYSTEM**

When your food is continually deficient in enzymes, the digestive organs become exhausted. Since the body puts a higher priority on digestion than on maintaining health, it will steal enzymes from the immune system and blood vessels that regulate cholesterol, to help with digestion. Thus, nutritional enzyme supplements can help take some of the stress off not only your digestive organs, but also your immune system and simultaneously assist in cholesterol maintenance.

**CELLULAR ENZYMES ACTIVITY IS INFLUENCED BY SMALL CHANGES IN PH.**

Maintaining alkalinity at the cell is the cornerstone of immunity, longevity and a healthy metabolism for all glands, organs and systems. Eating more raw fruit and raw vegetables will assist in reaching and maintaining alkalinity. When we are born, every cell in the body is alkaline. Raw food's alkaline ash, mops acid ash deposits left by meat, chicken, and coffee and refined sugar products. It takes thirty glasses of water to neutralize the acid of one coke.

*" When cellular PH is optimal antioxidant enzyme activity is optimal, causing free radicals to be effectively neutralized. "* Vernon Mountcastle, M.D.



# THE ENZYME DATA BANK USER MANNUAL

## TABLE OF CONTENTS

# INTRODUCTION

1.1) **Definition of the scope of the data bank**

The 'ENZYME' data bank contains the following data for each type of characterized enzyme for which an EC number has been provided:

- EC number
- Recommended name
- Alternative names (if any)
- Catalytic activity
- Cofactors (if any)
- Pointers to the SWISS-PROT entry/entries that correspond to the enzyme (if any)

The ***ENZYME data bank*** can be useful to anybody working with enzymes and that it can be of help in the development of computer programs involved with the manipulation of metabolic pathways.

1.2) **Sources of the data**

The main sources for the data in the ENZYME data bank comes from recommendations of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (IUBMB) [1] A minor part of the data has been extracted from the literature.

[1] Enzyme Nomenclature, NC-IUBMB, Academic Press, New York, (1992).

Assigning the EC numbers for newly characterized enzymes is the responsibility of the Nomenclature Committee of IUBMB (NC-IUBMB). To contact the committee one should write to:

**Prof. K. Tipton**
**Department of Biochemistry**
**Trinity College**
**Dublin2**
**Republic of Ireland**

He can also be contacted by electronic mail at the following address:
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# CONVENTIONS USED IN THE DATA BANK

[NOTE : The data has been restructured for Sybase. This section describes the original flat-file structure. ]

2.1) **Structure of an entry**
The entries in the database data file (ENZYME. DAT) are structured so as to be usable by human readers as well as by computer programs. Each entry in the database is composed of lines. Different types of lines, each with its own format, are used to record the various types of data, which make up the entry. The general structure of a line is the following:

| Characters | Content |
|---|---|
| 1 to 2 | Two - Character line code. Indicates the type of information contained in the line. |
| 3 to 5 | Blank |
| 6 up to 78 | Data |

The currently used line types, along with their respective line codes, are listed below:

| | | |
|---|---|---|
| **ID** | Identification | (Begins each entry: 1 per entry) |
| **ED** | Description (official name) | (>=1 per entry) |
| **AN** | Alternate name(s) | (>=0 per entry) |
| **CA** | Catalytic activity | (>=0 per entry) |
| **CF** | Cofactor (s) | (>=0 per entry) |
| **CC** | Comments | (>=0 per entry) |
| **DI** | Disease(s) associated with the enzyme | (>=0 per entry) |
| **DR** | Cross-references to SWISS-PROT | (>=0 per entry) |
| **//** | Termination line | (Ends each entry; 1 per entry ) |

Some entries do not contain all of the line types, and some line types occur many times in a single entry. Each entry must begin with an identification line (ID) and end with a terminator line (//).

A detailed description of each line type is given in the next section of this document.

2.2 ) **One sample entry**

| | |
|---|---|
| **ID** | 1.14.17.3 |
| **DE** | PETIDYLGLYCINE MONOOXYGENASE. |
| **AN** | PEPTIDYL ALPHA-AMIDATING ENZYME. |
| **CA** | DEHYDROASCORBATE+ H(2)O |
| **CF** | COPPER. |
| **CC** | -!- PEPTIDYLGLYCINES WITH A NEUTRAL AMINO ACID RESIDUE IN THE |
| **CC** | PENULTIMATE POSITION ARE THE BEST SUBSTRATES FOR THEENZYME. |

**CC** -!- THE ENZYME ALSO CATALYZES THE DISMUTATATIONOF THE PRODUCT TO
**CC** GLYOXYLATE AND THE CORRESPONDING DESGLYCINE PEPTIDE AMIDE.
**DR** P10731, AMD BOVIN; AMD HUMAN; P14925, AMD-RAT ;
**DR** P08478, AMD1-XENLA; P12890, AMD2-XENLA;

## 3) THE DIFFERENT LINE TYPES

This section describes in detail the format of each type of line used in the database.

**3.1) The ID line**
The ID (Identification) line is always the first line of an entry . The format of the ID line is:

## ID EC NUMBER

Examples:

ID **1 . 1 . 1 . 1**
ID **6 . 3 . 2 . 1**

3.2) **The DE line**
The DE (Description) line(s) contain the NC-IIUB recommended name for an enzyme. The format of the DE Line is:

**DE DESCRIPTION**.
Examples:

**DE UDP-N ACETYLMURAMOYLALANYL -D GLUTAMYL-2,6-**
**DE DIAMINOPIMELATE—D-**

**DE ALANYL-D-ALANYL LIGASE**.

**Important note**: Enzymes are sometimes deleted from the EC list, others are renumbered; however, the NC-IUBMB does not allocate the old numbers to new enzymes. Obsolete EC numbers are indicated in this data bank by the following DE line syntaxes. For deleted ENZYMES:

**DE DELETED ENTR**
and for renumbered enzymes:

**DE TRANSFERRED ENTRY: x . x . x . x .**
where x.x.x.x. is the new, valid, EC number; as shown in the following example:

**DE TRANSFERRED ENTRY: 1 . 7 . 99 . 5 .**

**3.3) The AN line**
The AN (Alternate Name) line(s) are used to indicate the different name(s), other than the NC-IUMB recommended name, that are used in the literature to describe an enzyme. The format of the AN line is:

**AN NAME**

As an example we list here both the DE and AN lines for the enzyme EC 2.7.7.31:

**DE DNA NUCLEOTIDYLEXOTRANSFERASE**
**AN TERMINAL ADDITION ENZYME**
**AN TERMINAL TRANSFERASE**
**AN TERMINAL DEOXYRIBONUCLEOTIDYLTRANSFERASE**

**3.4) The CA line**
The CA ( Catalytic Activity) line(s) are used to indicate the reaction (s) catalyzed by an enzyme. The format of the CA line is:

**CA REACTION.**

Where the reaction is indicated following the recommendations of the NC-IUMB. The majority of the reactions are described using a standard chemical reaction format:

**CA SUBSTRATE-11 + SUBSTRATE-12 [+ SUBSTRATE-1N…] = SUBSTRATE-21**
**CA SUBSTRATE-22 [+ SUBSTRATE-2N].**

As shown in the following examples:

**CA L-MALATE + NAD(+) = OXALOACETATE + NADH**

**CA 2 ATP + GLUTAMINE + CO(2) + H(2)O = 2ADP + ORTHOPHOSPHATE +**
**CA GLUTAMATE + CARBAMOYL PHOSPHATE.**
In some cases free text is used to describe a reaction. As shown in the following examples:

**CA DEGRADES STARCH TO CYCLODEXTRINS BY FORMATION OF A 1,4-**
**CA ALPHA-D-GLUCOSIDIC BOND.**

**CA CLEAVES LEU- | -LEU BOND IN ANGIOTENSINOGEN TO GENERATE**
**CA ANGIOTENSIN I.**

Notes

- Subscript and superscript are indicated between brackets: for example NAD+ and NADP+ are indicated as NAD(+) and NADP(+), H2O as H(2)O, co2 as CO(2), etc.
- Greek letters are spelled out.

**3.5) The CF line**

The CF (Cofactor) line(s) are used to indicate which cofactor(s) an enzyme requires. The format of the CF line is:

**CF COFACTOR 1; COFACTOR 2 OR COFACTOR 3 [; COFACTOR N. . . ].**

Examples:

**CF PYRIDOXAL PHOSPHATE**
**CF MOLYBDENUM OR VANADIUM; IRON-SULPHUR.**
**CF IRON; ASCORBATE.**

**3.6) The CC line**

The CC lines are free text comments on the entry, and may be used to convey any useful information.

Examples:

**CC -!- THE PRODUCT SPONTANEOUSLY ISOMERIZED TO L-ASCORBATE.**

**CC -!- SOME MEMBERS OF THIS GROUP OXIDIZE ONLY PRIMARY**
**CC ALCOHOL; OTHERS ACT ALSO ON SECONDARY ALCOHOLS.**

**3.7) The DI line**

The DI (Disease) line(s) are used to indicate the known disease(s) associated with a deficiency of the enzyme. Currently this information is only given for human diseases listed in the MIM book [2].

[2] McKusick V.A.
Mendelian Inheritance in Man
Catalogs of autosomal dominant, autosomal recessive, and x-linked phenotypes
Tenth Edition
John Hopkins University Press, Baltimore, (1991).

The format of the DI line is:

**DI DISEASE NAME; MIM: NUMBER**

Where "NUMBER" is the MIM catalog number of the disease (or phenotype).

Examples:

**DI XANTHINURIA; MIM: 278300**
**DI PHENYLKETONURIA; MIM: 261600**

**3.8) The DR line**
The DR (Data Bank Reference) line(s) are used as pointers to the SWISS-PROT entries that corresponds to the enzyme being described. The format of the DR line is:

**DR AC NB, ENTRY NAME; AC NB, ENTRY NAME; AC NB, ENTRY NAME;**

where:
- 'AC NB' is the SWISS-PROT primary accession number of the entry to which reference is being made.
- 'ENTRY NAME' is the SWISS-PROT entry name.

Example:

**DR POO366, DHE3 BOVIN; P00368, DHE3 CHICK; P00367, DHE3 HUMAN;**
**DR P10860, DHE3 RAT;**

**3.9) The termination line**
The // (terminator) line contains no data or comments. It designates the end of an entry.
**4.) RELEASE NOTES**

The data bank is complete and up to date. Until new enzyme nomenclature data is published , there is only the plan to update the SWISS-PROT pointers at each release of the protein sequence data bank, correct eventual errors, and complete the information concerning synonyms and cofactors using the literature.

**REPORT FORM ON AN ENZYME NOT INCLUDED IN THE CURRENT EDITION OF ENZYME NOMENCLATURE**

The Nomenclature Committee of the International Union of Biochemistry intends to update the Enzyme List from time to time by the publication of Supplements, and ultimately by the production of a full new edition. The assistance of the biochemical community is sought in this task. This sheet can be used top draw the attention of the editor to enzymes missing from this list, or to errors in existing entries.

Reaction catalyzed:

Systematic and other names proposed by authors:

Subclass in Enzyme Nomenclature proposed (e.g. 2.7.7-):

Source of enzyme (e.g. yeast, horse liver. E.coli, etc.):

Brief comment on specificity:

Cofactor requirement(s):

References (if accepted by a journal but not yet published, give name of journal and date of acceptance; please enclose reprints if available):

Name and address of person submitting this report:

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