

# Transketolase

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Transketolase, an enzyme of both the pentose phosphate pathway in animals and the Calvin cycle of photosynthesis, catalyzes two important reactions, which operate in opposite directions in these two pathways. In the first reaction of the pentose phosphate pathway, the cofactor thiamine diphosphate accepts a 2-carbon fragment from a 5-carbon ketose, then transfers this fragment to a 5-carbon aldose to form a 7-carbon ketose. The abstraction of two carbons from D-xylulose-5-P yields the 3-carbon aldose glyceraldehyde-3-P. In the Calvin cycle, transketolase catalyzes the reverse reaction, the conversion of sedoheptulose-7-P and glyceraldehyde-3-P to pentoses, the aldose D-ribose-5-P and the ketose D-xylulose-5-P. The second reaction catalyzed by transketolase in the pentose phosphate pathway involves the same thiamine diphosphate-mediated transfer of a 2-carbon fragment from D-xylulose-5-P to the aldose erythrose-4-phosphate, affording fructose-6-phosphate and glyceraldehyde-3-P. Again, in the Calvin cycle exactly the same reaction occurs, but in the opposite direction. Moreover, in the Calvin cycle this is the first reaction catalyzed by transketolase, rather than the second. In mammals, transketolase connects the pentose phosphate pathway to glycolysis, feeding excess sugar phosphates into the main carbohydrate metabolic pathways. Its presence is necessary for the production of NADPH, especially in tissues actively engaged in biosyntheses, such as fatty acid synthesis by the liver and mammary glands, and for steroid synthesis by the liver and adrenal glands. Thiamine diphosphate is an essential cofactor, along with calcium. ([From the Wikipedia article Transketolase](#).)

## Recent Publications on Transketolase:



- [Design and characterization of a prototype enzyme microreactor: Quantification of immobilized transketolase kinetics.](#)  
*In this work, we describe the design of an immobilized enzyme microreactor...* 21st November, 2009  
The Advanced Centre for Biochemical Engineering, Department of Biochemical- Biotechnol Prog. 2009 Nov 19. ([DOI Direct Link](#))
- [Halogenated Pyruvate Derivatives as Substrates of Transketolase from \*Saccharomyces cerevisiae\*.](#)  
*Pyruvate derivatives halogenated at C3 were shown to be donor substrates...* 18th November, 2009  
Belozersky Institute of Physico-Chemical Biology, Lomonosov Moscow State- Biochemistry (Mosc). 2009 Nov;74(11):1234-8.
- [Cooperative binding of substrates to transketolase from \*Saccharomyces cerevisiae\*.](#)  
*Catalytic activity of two active sites of transketolase and their affinity...* 10th November, 2009  
Belozersky Institute of Physico-Chemical Biology, Lomonosov Moscow State- Biochemistry (Mosc). 2009 Jul;74(7):789-92.
- [Enhanced D-ribose biosynthesis in batch culture of a transketolase-deficient \*Bacillus subtilis\* strain by citrate.](#)  
*In this study, the effects of citrate addition on D-ribose production were...* 7th November, 2009

- State Key Laboratory of Bioreactor Engineering, East China University of- J Ind Microbiol Biotechnol. 2009 Oct;36(10):1289-96. Epub 2009 Jul 15. ([DOI Direct Link](#))
- [Gel-based proteomics approach to the study of metabolic changes in pear tissue during storage.](#)  
*The effect of extreme gas conditions (anoxia and air) on the protein...*5th November, 2009  
BIOSYST-MeBioS Division, Katholieke Universiteit Leuven, Leuven, Belgium.- J Agric Food Chem. 2009 Aug 12;57(15):6997-7004. ([DOI Direct Link](#))
  - [Transketolase from \*Cyanophora paradoxa\*: in vitro import into cyanelles and pea chloroplasts and a complex history of a gene often, but not always, transferred in the context of secondary endosymbiosis.](#)  
*The glaucocystophyte *Cyanophora paradoxa* is an obligatorily...*4th November, 2009  
Max F. Perutz Laboratories, Department of Biochemistry and Cell Biology,- J Eukaryot Microbiol. 2009 Nov-Dec;56(6):568-76. ([DOI Direct Link](#))
  - [Decreased transketolase activity contributes to impaired hippocampal neurogenesis induced by thiamine deficiency.](#)  
*Thiamine deficiency (TD) impairs hippocampal neurogenesis. However, the...*23rd October, 2009  
Department of Neurology, Zhongshan Hospital & Shanghai Medical College,- J Neurochem. 2009 Oct;111(2):537-46. Epub 2009 Aug 13. ([DOI Direct Link](#))
  - [Homo D-Lactic Acid Fermentation from Xylose by Introduction of Xylose Assimilation Genes and Redirection of the Phosphoketolase Pathway to the Pentose Phosphate Pathway in L-Lactate Dehydrogenase Gene-Deficient \*Lactobacillus plantarum\*.](#)  
*Optically pure D-lactic acid fermentation from xylose was achieved by...*13th October, 2009  
Department of Molecular Science and Material Engineering, Graduate School- Appl Environ Microbiol. 2009 Oct 9. ([DOI Direct Link](#))
  - [Key role for transketolase activity in erythritol production by \*Trichosporonoides megachiliensis\* SN-G42.](#)  
*Erythritol is an important sugar alcohol industrially produced only by...*7th October, 2009  
Nikken Chemicals Co. Ltd., 1-12-6 Tsukiji, Chuou-ku, Tokyo 104-0045,- J Biosci Bioeng. 2009 Nov;108(5):385-90. Epub 2009 Jul 29. ([DOI Direct Link](#))
  - [Upregulation of glycolytic enzymes in proteins secreted from human colon cancer cells with 5-fluorouracil resistance.](#)  
*5-Fluorouracil (5-FU) is the most commonly used chemotherapeutic agent for...*1st October, 2009  
Research Institute and Hospital, National Cancer Center, Korea.- Electrophoresis. 2009 Jun;30(12):2182-92. ([DOI Direct Link](#))
  - [Cloning and expression of 1-deoxy-d-xylulose 5-phosphate synthase cDNA from \*Croton stellatopilosus\* and expression of 2C-methyl-d-erythritol 4-phosphate synthase and geranylgeranyl diphosphate synthase, key enzymes of plaunotol biosynthesis.](#)  
*1-Deoxy-d-xylulose 5-phosphate synthase (DXS, EC: 4.1.3.37), the first...*29th September, 2009  
Department of Pharmaceutical Chemistry and Pharmacognosy, Faculty of- J Plant Physiol. 2009 Sep 24. ([DOI Direct Link](#))
  - [Ensemble modeling for aromatic production in \*Escherichia coli\*.](#)  
*Ensemble Modeling (EM) is a recently developed method for metabolic...*5th September, 2009  
Department of Chemical and Biomolecular Engineering, University of- PLoS One. 2009 Sep 4;4(9):e6903. ([DOI Direct Link](#))
  - [Enhancing the flux of D-glucose to the pentose phosphate pathway in \*Saccharomyces cerevisiae\* for the production of D-ribose and ribitol.](#)  
*Phosphoglucose isomerase-deficient (*pgi1*) strains of *Saccharomyces*...*28th August, 2009  
VTT Technical Research Centre of Finland, P.O. Box 1000, FI-02044, Espoo,- Appl Microbiol Biotechnol. 2009 Aug 27. ([DOI Direct Link](#))
  - [Comparative proteomic analysis of lung cancer cell line and lung fibroblast cell line.](#)  
*Lung cancer is the leading cause of cancer-related to death in both men...*7th August, 2009  
Biotechnology Program, Faculty of Science, Chulalongkorn University,- Cancer Genomics Proteomics. 2009 Jul-Aug;6(4):229-37.
  - [Infantile encephalopathy due to vitamin deficiency in industrial countries.](#)  
*INTRODUCTION: Severe avitaminosis causing life-threatening conditions in...*9th July, 2009  
Pediatric Intensive Care Unit, Assaf Harofeh Medical Center, Zerifin,- Childs Nerv Syst. 2009



## Transketolase Patents:

- 7381551- [Saccharomyces cerevisiae mutant](#)
- 7439050- [Corynebacterium glutamicum genes encoding diaminopimelate epimerase](#)
- 7442523- [Nucleic acid and amino acid sequences relating to Streptococcus pneumoniae for diagnostics and therapeutics](#)
- 7462758- [Methods for the transformation of vegetal plastids](#)
- 7465569- [Flavone synthases, methods of using flavone synthases, and plants expressing flavone synthases](#)
- 7469185- [Primary rat hepatocyte toxicity modeling](#)
- 7485418- [Aberrantly methylated genes in pancreatic cancer](#)
- 7485774- [Methods and means for delivering inhibitory RNA to plants and applications thereof](#)
- 7491811- [Repressor-mediated tissue-specific gene expression in plants](#)
- 7494798- [Bacillus licheniformis chromosome](#)
- 7498445- [Thiazole-based nitric oxide donors capable of releasing two or more nitric oxide molecules and uses thereof](#)
- 7438912- [S.agalactiae antigens I + II](#)
- 7426441- [Methods for determining renal toxins](#)
- 7425435- [Corynebacterium glutamicum genes encoding phosphoenolpyruvate: sugar phosphotransferase system proteins](#)
- 7385123- [Process for preparing ketocarotenoids in genetically modified organisms](#)
- 7390509- [Compositions and methods for nutrition supplementation](#)
- 7393675- [Corynebacterium glutamicum genes encoding proteins involved in carbon metabolism and energy production](#)
- 7399618- [Method for producing L-histidine using bacteria of Enterobacteriaceae family](#)
- 7405343- [Methyl-D-erythritol phosphate pathway genes](#)
- 7407780- [Process for producing glycerol in recombinant bacterial host cells](#)
- 7408052- [Nucleic acid molecules and other molecules associated with the carbon assimilation pathway](#)
- 7410766- [Corynebacterium glutamicum genes encoding phosphoenolpyruvate: sugar phosphotransferase system proteins](#)
- 7415358- [Molecular toxicology modeling](#)
- 7422881- [DNAs coding for flavone synthases, methods of using flavone synthase DNAs, and plants, flowers, and vectors containing flavone synthase DNAs](#)
- 7504214- [Predicting outcome with tamoxifen in breast cancer](#)
- 7504242- [Process for the fermentative production of amino acids using coryneform bacteria in which OpcA gene expression is amplified](#)
- 7589257- [Genes for enhancing nitrogen utilization efficiency in crop plants](#)
- 7590493- [Methods for determining hepatotoxins](#)
- 7595382- [Gamma tocopherol methyltransferase coding sequences from Brassica and uses thereof](#)
- 7598031- [Method for the detection of gene transcripts in blood and uses thereof](#)
- 7601501- [Controlling osteogenesis by inhibition of osteogenic suppressors](#)
- 7601532- [Microarray for predicting the prognosis of neuroblastoma and method for predicting the](#)

[prognosis of neuroblastoma](#)

- 7605244- [Gamma tocopherol methyltransferase coding sequence from Brassica and uses thereof](#)
- 7608700- [Lactobacillus acidophilus nucleic acid sequences encoding stress-related proteins and uses therefor](#)
- 7611839- [Methods for diagnosing RCC and other solid tumors](#)
- 7615349- [Melanoma gene signature](#)
- 7589254- [Transgenic expression cassettes for expressing nucleic acid sequences in sink tissues of plants that store carbohydrate](#)
- 7579477- [Thiazole-based nitric oxide donors having alkyl substituent\(s\) and uses thereof](#)
- 7575913- [Chlamydia trachomatis genomic sequence and polypeptides, fragments thereof and uses thereof, in particular for the diagnosis, prevention and treatment of infection](#)
- 7507566- [Flavone synthases, methods of using flavone synthases, and plants expressing flavone synthases](#)
- 7510854- [Corynebacterium glutamicum genes encoding metabolic pathway proteins](#)
- 7514219- [Method for distinguishing between head and neck squamous cell carcinoma and lung squamous cell carcinoma](#)
- 7531333- [Process for producing isoprenoid compounds by microorganisms and a method for screening compounds with antibiotic or weeding activity](#)
- 7553503- [Phyto-nutraceutical synergistic composition for Parkinson's Disease](#)
- 7553952- [Gamma tocopherol methyltransferase coding sequence identified in Cuphea and uses thereof](#)
- 7560123- [Compositions and methods for nutrition supplementation](#)
- 7563944- [Expression cassette for nucleic acids in plant tissue containing starch](#)
- 7566557- [Gene variants coding for proteins from the metabolic pathway of fine chemicals](#)
- 7569379- [Pentose-fermentative transformed zymobacter microorganisms](#)
- 7618819- [Use of pseudogene insertion sites to create novel traits in transgenic organisms](#)

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