

SHMT1 tetramer cleaves HTMLYS to yield TEABL and Gly

D'Eustachio, P.

European Bioinformatics Institute, New York University Langone Medical Center, Ontario Institute for Cancer Research, Oregon Health and Science University.

The contents of this document may be freely copied and distributed in any media, provided the authors, plus the institutions, are credited, as stated under the terms of [Creative Commons Attribution 4.0 International \(CC BY 4.0\) License](#). For more information see our [license](#).

06/11/2024

Introduction

Reactome is open-source, open access, manually curated and peer-reviewed pathway database. Pathway annotations are authored by expert biologists, in collaboration with Reactome editorial staff and cross-referenced to many bioinformatics databases. A system of evidence tracking ensures that all assertions are backed up by the primary literature. Reactome is used by clinicians, geneticists, genomics researchers, and molecular biologists to interpret the results of high-throughput experimental studies, by bioinformaticians seeking to develop novel algorithms for mining knowledge from genomic studies, and by systems biologists building predictive models of normal and disease variant pathways.

The development of Reactome is supported by grants from the US National Institutes of Health (P41 HG003751), University of Toronto (CFREF Medicine by Design), European Union (EU STRP, EMI-CD), and the European Molecular Biology Laboratory (EBI Industry program).

Literature references

Fabregat, A., Sidiropoulos, K., Viteri, G., Forner, O., Marin-Garcia, P., Arnau, V. et al. (2017). Reactome pathway analysis: a high-performance in-memory approach. *BMC bioinformatics*, 18, 142. [↗](#)

Sidiropoulos, K., Viteri, G., Sevilla, C., Jupe, S., Webber, M., Orlic-Milacic, M. et al. (2017). Reactome enhanced pathway visualization. *Bioinformatics*, 33, 3461-3467. [↗](#)

Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res*, 46, D649-D655. [↗](#)

Fabregat, A., Korninger, F., Viteri, G., Sidiropoulos, K., Marin-Garcia, P., Ping, P. et al. (2018). Reactome graph database: Efficient access to complex pathway data. *PLoS computational biology*, 14, e1005968. [↗](#)

Reactome database release: 90

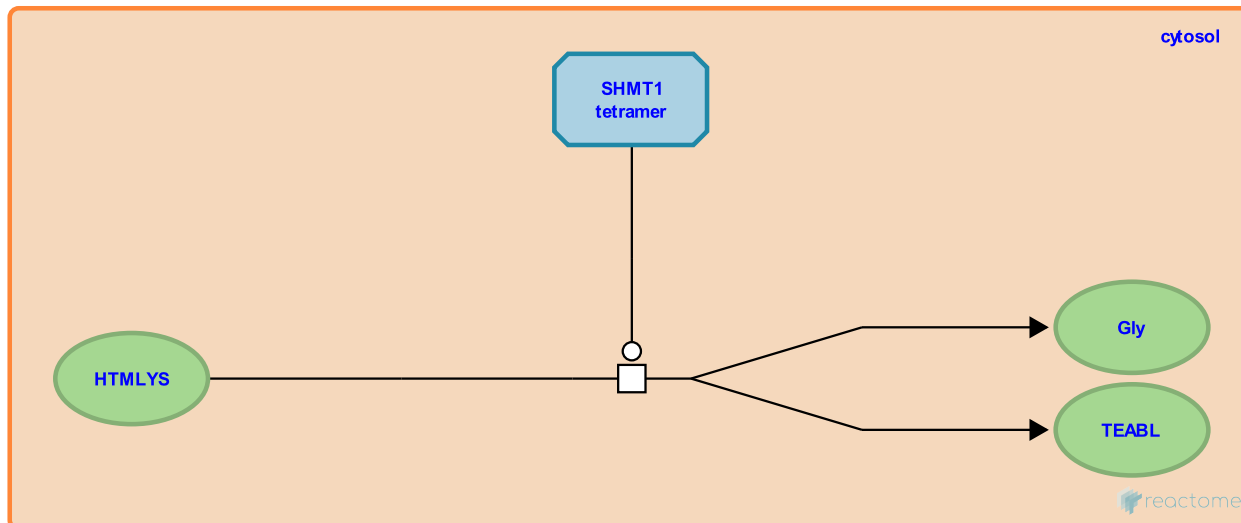
This document contains 1 reaction ([see Table of Contents](#))

SHMT1 tetramer cleaves HTMLYS to yield TEABL and Gly ↗

Stable identifier: R-HSA-71249

Type: transition

Compartments: cytosol



Cytosolic serine hydroxymethyltransferase tetramer (SHMT1) catalyzes the reaction of (3S)-3-hydroxy-N(6),N(6),N(6)-trimethyl-L-lysine(1+) (HTMLYS) to form glycine (Gly) and 4-trimethylammoniumbutanal (TEABL). Ogata & Fujioka (1981) and Masuda et al. (1987) purified a tetrameric cytosolic rat enzyme that in the presence of tetrahydrofolate catalyzes the conversion of serine to glycine but that in its absence catalyzes the cleavage of L-allothreonine to glycine and an aldehyde. Vaz & Wanders (2002) inferred that this enzyme and its human ortholog mediate the cleavage of HTMLYS to yield TEABL and Gly in vivo. This inference has been confirmed by computational docking studies and assays of the activity of purified recombinant human enzyme in vitro (Percudani et al. 2023).

Literature references

- Hayashi, H., Sakamoto, M., Wada, H., Yamamoto, M., Nishizaki, I., Masuda, T. (1987). Affinity purification and characterization of serine hydroxymethyltransferases from rat liver. *J Biochem*, 101, 643-52. ↗
- Malatesta, M., Polverini, E., Di Salvo, M., Battistutta, R., Peracchi, A., Percudani, R. et al. (n.d.). One substrate - many enzymes virtual screening uncovers missing genes of carnitine biosynthesis in human and mouse (preprint). Retrieved from <https://www.researchsquare.com/article/rs-3295520/v1>
- Vaz, FM., Wanders, RJA. (2002). Carnitine biosynthesis in mammals. *Biochem J*, 361, 417-29. ↗
- Ogawa, H., Fujioka, M. (1981). Purification and characterization of cytosolic and mitochondrial serine hydroxymethyltransferases from rat liver. *J Biochem*, 90, 381-90. ↗

Editions

2009-05-19	Revised	D'Eustachio, P.
2022-07-19	Revised	D'Eustachio, P.