Ceramide turnover (version 2020.5) in the IUPHAR/BPS Guide to Pharmacology Database

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Abstract

Ceramides are a family of sphingophospholipids synthesized in the endoplasmic reticulum, which mediate cell stress responses, including apoptosis, autophagy and senescence, Serine palmitoyltransferase generates 3-ketosphinganine, which is reduced to dihydrosphingosine (dihydrosphingosine). N-Acylation allows the formation of dihydroceramides, which are subsequently reduced to form ceramides. Once synthesized, ceramides are trafficked from the ER to the Golgi bound to the ceramide transfer protein, CERT (COL4A3BP, Q9Y5P4). Ceramide can be metabolized via multiple routes, ensuring tight regulation of its cellular levels. Addition of phosphocholine generates sphingomyelin while carbohydrate is added to form glucosyl- or galactosylceramides. Ceramidase re-forms sphingosine or sphinganine from ceramide or dihydroceramide. Phosphorylation of ceramide generates ceramide phosphate. The determination of accurate kinetic parameters for many of the enzymes in the sphingolipid metabolic pathway is complicated by the lipophilic nature of the substrates.

Contents

This is a citation summary for Ceramide turnover in the Guide to Pharmacology database (GtoPdb). It exists purely as an adjunct to the database to facilitate the recognition of citations to and from the database by citation analyzers. Readers will almost certainly want to visit the relevant sections of the database which are given here under database links.

GtoPdb is an expert-driven guide to pharmacological targets and the substances that act on them. GtoPdb is a reference work which is most usefully represented as an on-line database. As in any publication this work should be appropriately cited, and the papers it cites should also be recognized. This document provides a citation for the relevant parts of the database, and also provides a reference list for the research cited by those parts.

Please note that the database version for the citations given in GtoPdb are to the most recent preceding version in which the family or its subfamilies and targets were substantially changed. The links below are to the current version. If you need to consult the cited version, rather than the most recent version, please contact the GtoPdb curators.

Database links

Ceramide turnover
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=767

Serine palmitoyltransferase
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=788

Enzymes

SPT1 (serine palmitoyltransferase long chain base subunit 1)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2509

SPT2 (serine palmitoyltransferase long chain base subunit 2)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2510

SPT3 (serine palmitoyltransferase long chain base subunit 3)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2511

SPTSSA (serine palmitoyltransferase small subunit A)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2512

SPTSSB (serine palmitoyltransferase small subunit B)
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2513

3-ketodihydrosphingosine reductase
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=791
Enzymes

3-ketodihydrosphingosine reductase  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2463

Ceramide synthase  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=789

Enzymes

CERS1(ceramide synthase 1)  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2474
CERS2(ceramide synthase 2)  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2475
CERS3(ceramide synthase 3)  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2476
CERS4(ceramide synthase 4)  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2477
CERS5(ceramide synthase 5)  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2478
CERS6(ceramide synthase 6)  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2479

Sphingolipid Δ⁴-desaturase  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=790

Enzymes

delta 4-desaturase, sphingolipid 1  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2484
delta 4-desaturase, sphingolipid 2  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2485

Sphingomyelin synthase  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=774
Introduction to Sphingomyelin synthase  
https://www.guidetopharmacology.org/GRAC/FamilyIntroductionForward?familyId=774

Enzymes

sphingomyelin synthase 1  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2520
sphingomyelin synthase 2  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2521
sterile alpha motif domain containing 8  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2525

Sphingomyelin phosphodiesterase  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=773

Enzymes

sphingomyelin phosphodiesterase 1  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2514
sphingomyelin phosphodiesterase 2  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2515
sphingomyelin phosphodiesterase 3  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2516
sphingomyelin phosphodiesterase 4  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2517
sphingomyelin phosphodiesterase acid-like 3A  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2518
sphingomyelin phosphodiesterase acid-like 3B  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2519

Neutral sphingomyelinase coupling factors  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=772

Enzymes

embryonic ectoderm development  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2487
neutral sphingomyelinase activation associated factor  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2495

Ceramide glucosyltransferase  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=775

Enzymes

UDP-glucose ceramide glucosyltransferase  
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2528

Acid ceramidase  
https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=769

Enzymes

N-acylsphingosine amidohydrolase 1
Neutral ceramidases
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2491

Enzymes
N-acylsphingosine amidohydrolase 2
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2492
N-acylsphingosine amidohydrolase 2B
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2493

Alkaline ceramidases
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?familyId=768

Enzymes
alkaline ceramidase 1
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2468
alkaline ceramidase 2
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2469
alkaline ceramidase 3
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2470

Ceramide kinase
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?familyId=771

Enzymes
ceramide kinase
https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2473

References


