

## Class C Orphans in GtoPdb v.2023.1

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### Abstract

This set contains class C 'orphan' G protein coupled receptors where the endogenous ligand(s) is not known.

### Contents

This is a citation summary for Class C Orphans 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. For further details see [4].

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

#### Class C Orphans

<https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=18>

#### Introduction to Class C Orphans

<https://www.guidetopharmacology.org/GRAC/FamilyIntroductionForward?familyId=18>

#### Receptors

##### *GPR156*

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=209>

##### *GPR158*

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=210>

##### *GPR179*

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=211>

##### *GPRC5A*

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=258>

##### *GPRC5B*

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=259>

[GPRC5C](#)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=260>

[GPRC5D](#)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=261>

[GPRC6 receptor](#)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=55>

## References

1. Attar R, Gaudet F, Tornetta M, Teplyakov A, Mendonca M, Edavettal S, Pillarisetti K, Majewski N, Li Y and Luistro LL III *et al.*. (2020) Anti-GPRC5D antibodies, bispecific antigen binding molecules that bind GPRC5D and CD3, and uses thereof Patent number: [US10562968B2](#). Assignee: Janssen Pharmaceutica NV. Priority date: 20/07/2016. Publication date: 07/11/2022.
2. Bräuner-Osborne H, Jensen AA, Sheppard PO, Brodin B, Krogsgaard-Larsen P and O'Hara P. (2001) Cloning and characterization of a human orphan family C G-protein coupled receptor GPRC5D. *Biochim Biophys Acta* **1518**: 237-248 [[PMID:11311935](#)]
3. Bräuner-Osborne H and Krogsgaard-Larsen P. (2000) Sequence and expression pattern of a novel human orphan G-protein-coupled receptor, GPRC5B, a family C receptor with a short amino-terminal domain. *Genomics* **65**: 121-8 [[PMID:10783259](#)]
4. Buneman P, Christie G, Davies JA, Dimitrellou R, Harding SD, Pawson AJ, Sharman JL and Wu Y. (2020) Why data citation isn't working, and what to do about it *Database* **2020** [[PMID:32367113](#)]
5. Cheng Y and Lotan R. (1998) Molecular cloning and characterization of a novel retinoic acid-inducible gene that encodes a putative G protein-coupled receptor. *J Biol Chem* **273**: 35008-35015 [[PMID:9446598](#)]
6. Cool BH, Chan GC, Lee L, Oshima J, Martin GM and Hu Q. (2010) A flanking gene problem leads to the discovery of a Gprc5b splice variant predominantly expressed in C57Bl/6J mouse brain and in maturing neurons. *PLoS ONE* **5**: e10351 [[PMID:20436672](#)]
7. Deng J, Fujimoto J, Ye XF, Men TY, Van Pelt CS, Chen YL, Lin XF, Kadara H, Tao Q, Lotan D and Lotan R. (2010) Knockout of the tumor suppressor gene Gprc5a in mice leads to NF-kappaB activation in airway epithelium and promotes lung inflammation and tumorigenesis. *Cancer Prev Res (Phila)* **3**: 424-37 [[PMID:20354164](#)]
8. Faure H, Gorojankina T, Rice N, Dauban P, Dodd RH, Bräuner-Osborne H, Rognan D and Ruat M. (2009) Molecular determinants of non-competitive antagonist binding to the mouse GPRC6A receptor. *Cell Calcium* **46**: 323-32 [[PMID:19836834](#)]
9. Inoue S, Sano H and Ohta M. (2000) Growth suppression of Escherichia coli by induction of expression of mammalian genes with transmembrane or ATPase domains. *Biochem Biophys Res Commun* **268**: 553-561 [[PMID:10679242](#)]
10. Jacobsen SE, Nørskov-Lauritsen L, Thomsen AR, Smajilovic S, Wellendorph P, Larsson NH, Lehmann A, Bhatia VK and Bräuner-Osborne H. (2013) Delineation of the GPRC6A receptor signaling pathways using a mammalian cell line stably expressing the receptor. *J Pharmacol Exp Ther* **347**: 298-309 [[PMID:24008333](#)]
11. Kuang D, Yao Y, Lam J, Tsushima RG and Hampson DR. (2005) Cloning and characterization of a family C orphan G-protein coupled receptor. *J Neurochem* **93**: 383-91 [[PMID:15816861](#)]
12. Peachey NS, Ray TA, Florijn R, Rowe LB, Sjoerdsma T, Contreras-Alcantara S, Baba K, Tosini G, Pozdeyev N and Iuvone PM *et al.*. (2012) GPR179 is required for depolarizing bipolar cell function and is mutated in autosomal-recessive complete congenital stationary night blindness. *Am J Hum Genet* **90**: 331-9 [[PMID:22325362](#)]
13. Pi M, Faber P, Ekema G, Jackson PD, Ting A, Wang N, Fontilla-Poole M, Mays RW, Brunden KR and Harrington JJ *et al.*. (2005) Identification of a novel extracellular cation-sensing G-protein-coupled receptor. *J Biol Chem* **280**: 40201-9 [[PMID:16199532](#)]
14. Pi M, Wu Y and Quarles LD. (2011) GPRC6A mediates responses to osteocalcin in  $\beta$ -cells in vitro and pancreas in vivo. *J Bone Miner Res* **26**: 1680-3 [[PMID:21425331](#)]
15. Pi M, Zhang L, Lei SF, Huang MZ, Zhu W, Zhang J, Shen H, Deng HW and Quarles LD. (2010) Impaired osteoblast function in GPRC6A null mice. *J Bone Miner Res* **25**: 1092-102 [[PMID:19874200](#)]
16. Pillarisetti K, Edavettal S, Mendonça M, Li Y, Tornetta M, Babich A, Majewski N, Husovsky M, Reeves D

- and Walsh E *et al.*. (2020) A T-cell-redirecting bispecific G-protein-coupled receptor class 5 member D x CD3 antibody to treat multiple myeloma. *Blood* **135**: 1232-1243 [PMID:32040549]
17. Robbins MJ, Michalovich D, Hill J, Calver AR, Medhurst AD, Gloger I, Sims M, Middlemiss DN and Pangalos MN. (2000) Molecular cloning and characterization of two novel retinoic acid-inducible orphan G-protein-coupled receptors (GPRC5B and GPRC5C). *Genomics* **67**: 8-18 [PMID:10945465]
  18. Speca DJ, Lin DM, Sorensen PW, Isacoff EY, Ngai J and Dittman AH. (1999) Functional identification of a goldfish odorant receptor. *Neuron* **23**: 487-98 [PMID:10433261]
  19. Wellendorph P and Bräuner-Osborne H. (2004) Molecular cloning, expression, and sequence analysis of GPRC6A, a novel family C G-protein-coupled receptor. *Gene* **335**: 37-46 [PMID:15194188]
  20. Wellendorph P, Burhenne N, Christiansen B, Walter B, Schmale H and Bräuner-Osborne H. (2007) The rat GPRC6A: cloning and characterization. *Gene* **396**: 257-67 [PMID:17478059]
  21. Wellendorph P, Hansen KB, Balsgaard A, Greenwood JR, Egebjerg J and Bräuner-Osborne H. (2005) Deorphanization of GPRC6A: a promiscuous L-alpha-amino acid receptor with preference for basic amino acids. *Mol Pharmacol* **67**: 589-97 [PMID:15576628]
  22. Xu J, Tian J and Shapiro SD. (2005) Normal lung development in RAIG1-deficient mice despite unique lung epithelium-specific expression. *Am J Respir Cell Mol Biol* **32**: 381-387 [PMID:15677768]
  23. Ye X, Tao Q, Wang Y, Cheng Y and Lotan R. (2009) Mechanisms underlying the induction of the putative human tumor suppressor GPRC5A by retinoic acid. *Cancer Biol Ther* **8**: 951-62 [PMID:19279407]
  24. Zhang YW, Mess J, Aizarani N, Mishra P, Johnson C, Romero-Mulero MC, Rettkowski J, Schönberger K, Obier N and Jäcklein K *et al.*. (2022) Hyaluronic acid-GPRC5C signalling promotes dormancy in haematopoietic stem cells. *Nat Cell Biol* [PMID:35725769]