

IUPHAR Guide to IMMUNOPHARMACOLOGY

User Guide

The Guide to IMMUNOPHARMACOLOGY (GtoImmuPdb) has been developed as an extension to the existing Guide to PHARMACOLOGY (GtoPdb).

In practise, this means that rather than build a new database, the underlying GtoPdb schema has been extended to incorporate new immune system specific data types (such as processes and cell types). It also means the existing GtoPdb website has been further developed to surface this new data and incorporate it into the existing search and browse mechanisms.

GtoImmuPdb does not therefore have its own website. What has been developed is a new portal (home page) which serves as a unique immunological access-point to the Guide to PHARMACOLOGY.

<http://dev.guidetopharmacology.org/immuno>

The portal has its own unique branding (header bar, logo and colour scheme) to distinguish it, but retains many of the layout features from the main GtoPdb site. This consistency should help users already familiar with GtoPdb to orientate themselves with the new GtoImmuPdb.

Users can familiarise themselves with the existing GtoPdb site by reading the website tutorial:

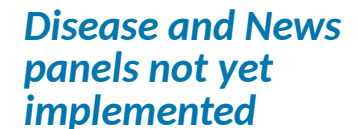
http://www.guidetopharmacology.org/GuidetoPHARMACOLOGY_Tutorial.pdf

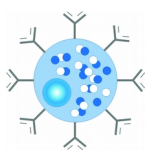
The guide in this document gives an overview of the new GtoImmuPdb portal, and illustrates the new additions to existing pages that have been developed for GtoImmuPdb.

Information on the new data incorporated into GtoImmuPdb is described in more detail in other documentation.

Process

Cell Type





GtoImmuPdb User Guide – Target Families Page

The screenshot shows the IUPHAR Guide to IMMUNOPHARMACOLOGY website. At the top is the IUPHAR logo and the title 'Guide to IMMUNOPHARMACOLOGY'. Below this is a navigation bar with links: Home, About, Targets, Ligands, Resources, Advanced search, and Guide to PHARMACOLOGY Home. A search bar is located to the right of the navigation bar. The main content area is titled 'G protein-coupled receptors' and includes a sub-header 'View a list of class A GPCRs, class B GPCRs, class C GPCRs, class frizzled GPCRs, adhesion class GPCRs or other 7TM proteins'. Below this is a 'Toggle GtoImmuPdb View' button, along with 'Expand all nodes' and 'Collapse all nodes' buttons. The main content area displays a hierarchical tree of target families. Some families are highlighted in blue, indicating immunological relevance. Annotations with arrows point to various elements: the 'Toggle GtoImmuPdb View' button, the 'Guide to Immunopharmacology view: ON' text, the hierarchical tree of target families, and specific highlighted family names: 'Adenosine receptors', 'Bile acid receptor', and 'Chemokine receptors'.

IUPHAR
Guide to IMMUNOPHARMACOLOGY

Home About Targets Ligands Resources Advanced search Guide to PHARMACOLOGY Home

Home Targets G protein-coupled receptors

G protein-coupled receptors

View a list of class A GPCRs, class B GPCRs, class C GPCRs, class frizzled GPCRs, adhesion class GPCRs or other 7TM proteins

Toggle GtoImmuPdb View Expand all nodes Collapse all nodes

Guide to Immunopharmacology view: **ON**

☐ G protein-coupled receptors **OVERVIEW**

- ☐ Orphan and other 7TM receptors **OVERVIEW**
 - Class A Orphans
 - Class B Orphans
 - Class C Orphans
 - Taste 1 receptors
 - Taste 2 receptors
 - Other 7TM proteins
- 5-Hydroxytryptamine receptors
- Acetylcholine receptors (muscarinic)
- Adenosine receptors**
- Adhesion Class GPCRs
- Adrenoceptors
- Angiotensin receptors
- Apelin receptor
- Bile acid receptor**
- Bombesin receptors
- Bradykinin receptors
- Calcitonin receptors
- Calcium-sensing receptors
- Cannabinoid receptors
- Chemerin receptor
- Chemokine receptors**
- Cholecystokinin receptors
- Class Frizzled GPCRs
- Complement peptide receptors

Uses same page as for GtoPdb, but has the GtoImmuPdb view switched on.

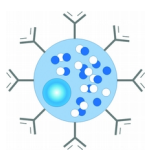
GtoImmuPdb view has it's own header and menu-bar.

Toggle button switches between GtoImmuPdb and GtoPdb view.

Target families displayed in hierarchical tree (as in GtoPdb)

Families containing targets 'flagged' as being of immunological relevance are highlighted.

Clicking on family name, while in GtoImmuPdb view, will link to the GtoImmuPdb view of that family's page.



GtoImmuPdb User Guide – Target Family Page



IUPHAR
Guide to IMMUNOPHARMACOLOGY

Search database

[Home](#) [About](#) [Targets](#) [Ligands](#) [Resources](#) [Advanced search](#) [Guide to PHARMACOLOGY Home](#)

[Home](#) [Targets](#) [G protein-coupled receptors](#) [Adenosine receptors](#)

Adenosine receptors

Unless otherwise stated all data on this page refer to the human proteins. Gene information is provided for human (Hs), mouse (Mm) and rat (Rn).

GtoImmuPdb in **ON** [Toggle GtoImmuPdb View](#) [Expand all sections](#) [Collapse all sections](#)

Overview

[« Hide](#) [More detailed introduction](#) [GO](#)

Adenosine receptors (**nomenclature as agreed by the [NC-IUPHAR Subcommittee on Adenosine Receptors \[20\]](#)**) are activated by the endogenous ligand **adenosine** (potentially **inosine** also at A_3 receptors). Crystal structures for the antagonist-bound and agonist-bound A_{2A} adenosine receptors have been described [27,67].

Receptors

[A₁ receptor](#) [Show summary »](#) [More detailed page](#) [GO](#)

[A_{2A} receptor](#) [Show summary »](#) [More detailed page](#) [GO](#)

[A_{2B} receptor](#) [Show summary »](#) [More detailed page](#) [GO](#)

[A₃ receptor](#) [Show summary »](#) [More detailed page](#) [GO](#)

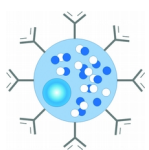
Uses same page as for GtoPdb, but has the GtoImmuPdb view switched on.

GtoImmuPdb view has it's own header and menu-bar.

Toggle button switches between GtoImmuPdb and GtoPdb view.

Link to detailed view of that target

Targets 'flagged' as being of immunological relevance are highlighted.



GtoImmuPdb User Guide – Detailed Target Page

The screenshot shows the GtoImmuPdb website interface. At the top, there is a header with a molecular structure image on the left and the text 'IUPHAR/BPS Guide to PHARMACOLOGY' on the right. A search bar is located to the right of the header. Below the header is a navigation bar with links: Home, About, Targets, Ligands, Resources, Advanced search, and Guide to IMMUNOPHARMACOLOGY Portal. The 'Guide to IMMUNOPHARMACOLOGY Portal' link is highlighted. Below the navigation bar is a breadcrumb trail: Home > Targets > G protein-coupled receptors > Adenosine receptors > A_{2A} receptor. The main content area is titled 'A_{2A} receptor' and contains the following information: Target id: 19, Nomenclature: A_{2A} receptor, Family: Adenosine receptors, and Annotation status: Annotated and expert reviewed. Below this is a 'Contents' section with a list of links: Gene and Protein Information, Previous and Unofficial Names, Database Links, Selected 3D Structures, Natural/Endogenous Ligands, Agonists, Antagonists, Transduction Mechanisms, Tissue Distribution, Expression Datasets, Functional Assays, Physiological Functions, Physiological Consequences of Altering Gene Expression, Phenotypes, Alleles and Disease Models, Clinically-Relevant Mutations and Pathophysiology, General Comments, Immunopharmacology Comments, Immuno Cell Type Associations, Immuno Process Associations, References, and Citation information. The last three items are grouped together with a bracket.

IUPHAR/BPS
Guide to PHARMACOLOGY

Home About Targets Ligands Resources Advanced search Guide to IMMUNOPHARMACOLOGY Portal

Home Targets G protein-coupled receptors Adenosine receptors A_{2A} receptor

A_{2A} receptor

? Target id: 19

Nomenclature: A_{2A} receptor

Family: Adenosine receptors

Annotation status: Annotated and expert reviewed » Email us

Contents:

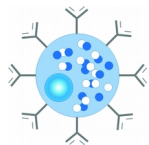
- Gene and Protein Information
- Previous and Unofficial Names
- Database Links
- Selected 3D Structures
- Natural/Endogenous Ligands
- Agonists
- Antagonists
- Transduction Mechanisms
- Tissue Distribution
- Expression Datasets
- Functional Assays
- Physiological Functions
- Physiological Consequences of Altering Gene Expression
- Phenotypes, Alleles and Disease Models
- Clinically-Relevant Mutations and Pathophysiology
- General Comments
- Immunopharmacology Comments
- Immuno Cell Type Associations
- Immuno Process Associations
- References
- Citation information

New GtoImmuPdb sections added that surface immune specific data added for GtoImmuPdb

At this level, header remain as existing GtoPdb version. But includes link back to GtoImmuPdb Portal

Within the contents, new sections are highlighted:

Immunopharmacology Comments
Immuno Cell Type Associations
Immuno Process Associations



GtoImmuPdb User Guide – Detailed Target Page

New GtoImmuPdb sections

Immunopharmacology Comments

immuno-oncology [4]

Immuno Cell Type Associations

Immuno Cell Type: pro-B-lymphocytes, B lymphocytes & Plasma cells

Cell Ontology Term: immature B cell (CL:0000816)

Comment:

References: 73

Immuno Cell Type: Mast cells

Cell Ontology Term: mast cell (CL:0000097)

mucosal type mast cell (CL:0000485)

Comment:

References:

Immuno Cell Type: T lymphocytes (gamma-delta type) and their immediate progenitors

Cell Ontology Term: mature gamma-delta T cell (CL:0000800)

Comment: no comment

References: 1

Immuno Cell Type: Natural Killer (NK) cells

Cell Ontology Term: non-specified (GTOIMMUPDB_DEFAULT_CELL:4)

Comment: A2A receptor has non-specific association to Natural Killer cells.

References:

Immuno Process Associations

Immuno Process: Regulation and responses to signals

Immuno Process ID: 4

Comment:

GO Annotation: Associated to GO processes

GO Processes: inflammatory response (GO:0006954) TAS

References:

Immuno Process: Inflammation

Immuno Process ID: 7

Comment:

GO Annotation: Associated to GO processes

GO Processes: inflammatory response (GO:0006954) TAS

References:

Immunopharmacology Comments:

- General comments, with any references, provided by our curators.

Immuno Cell Type Associations

Each sub-section gives details of the association between the target and the GtoImmuPdb top-level cell type category

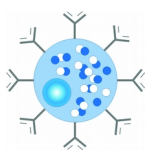
- Displays any associated Cell Ontology terms
- Displays curator comments and references

Immuno Process Associations

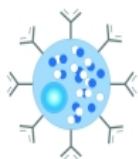
Each sub-section gives details of the association between the target and the GtoImmuPdb top-level immune process category

- Displays any associated Gene Ontology (GO) terms, IDs and GO evidence codes

Displays curator comments and references



GtoImmuPdb User Guide – Process Associations List Page



IUPHAR Guide to IMMUNOPHARMACOLOGY

Home About Targets Ligands Resources Advanced search Guide to PHARMACOLOGY Home

Home Targets Targets associated to immunological processes

Immuno Process Associations

Jump to: GPCR | Ion Channels | NHRs | Enzymes | Catalytic Receptors | Transporters | Other Protein Targets

Immune system dev. & differentiation Proliferation & cell death Prod. of signals & mediators Reg. & responses to signals Migration & chemotaxis Cell-mediated immunity Inflammation

Immune system development and differentiation

GPCRs

Official IUPHAR receptor name	Family	Process Association Comments	GO Associations	In GtoImmuPdb	Immunopharmacology Comments
A_{2A} receptor	Adenosine receptors	ffdsfdfsdfs		true	immuno-oncology [...]
C3a receptor	Complement peptide receptors		• tolerance induction to nonself antigen (GO:0002462) IEA	false	
CCR4	Chemokine receptors		• tolerance induction (GO:0002507) IEA	false	
CCR1	Chemokine receptors		• positive regulation of osteoclast differentiation (GO:0045672) IMP	false	
PAR2	Proteinase-activated receptors		• mature conventional dendritic cell differentiation (GO:0097029) IDA	false	
EP₄ receptor	Prostanoid receptors		• T-helper cell differentiation (GO:0042093) ISS	true	immuno-oncology [...], anti-inflammatory EP ₄ antagonists (see [...]).

New page developed to specifically surface details of immune process associated to targets

Uses the GtoImmuPdb header and menu-bar.

Quick links to each target class section of the table

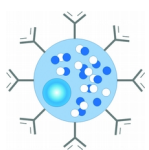
Tabs to switch between the different GtoImmuPdb Immuno Process top-level categories

Table is broken up into each target class (here just showing GPCRs)

Includes target name linking to detailed view page

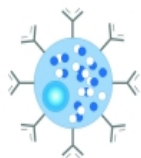
Shows comments & Gene Ontology (GO) associated terms

Indicates whether target has been manually tagged as being in GtoImmuPdb by curators



GtoImmuPdb User Guide – Cell Type Associations List Page

New page developed to specifically surface details of immune cell types associated to targets



IUPHAR Guide to IMMUNOPHARMACOLOGY

 Search database

Home About Targets Ligands Resources Advanced search Guide to PHARMACOLOGY Home

Home Targets Targets associated to cell types

Cell Type Associations

Jump to: [GPCR](#) | [Ion Channels](#) | [NHRs](#) | [Enzymes](#) | [Catalytic Receptors](#) | [Transporters](#) | [Other Protein Targets](#)

B cells T cells (α/β) T cells (γ/δ) NK cells Polymorphonuclear leukocytes Mononuclear leukocytes Mast cells

pro-B-lymphocytes, B lymphocytes & Plasma cells

GPCRs

Official IUPHAR receptor name	Family	Cell Type Association Comments	Cell Ontology Associations	In GtoImmuPdb	Immunopharmacology Comments
A_{2A} receptor	Adenosine receptors		• immature B cell (CL:0000816)	true	immuno-oncology
S1P₁ receptor	Lysophospholipid (S1P) receptors	B- and T-lymphocytes predominantly express S1P ₁ receptors, with S1P ₃ and S1P ₄ expressed at lower levels.	• B cell (CL:0000236)	true	

Ion Channels

Official IUPHAR receptor name	Family	Cell Type Association Comments	Cell Ontology Associations	In GtoImmuPdb	Immunopharmacology Comments
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Nuclear Hormone Receptors

Official IUPHAR receptor name	Family	Cell Type Association Comments	Cell Ontology Associations	In GtoImmuPdb	Immunopharmacology Comments
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Enzymes

Official IUPHAR receptor name	Family	Cell Type Association Comments	Cell Ontology Associations	In GtoImmuPdb	Immunopharmacology Comments
		BTK is essential for B			

Uses the GtoImmuPdb header and menu-bar.

Quick links to each target class section of the table

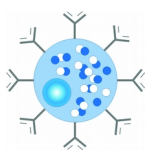
Tabs to switch between the different GtoImmuPdb Immuno Process top-level categories

Table is broken up into each target class (here just showing GPCRs)

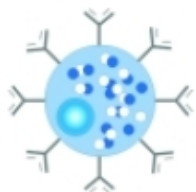
Indicates whether target has been manually tagged as being in GtoImmuPdb by curators

Includes target name linking to detailed view page

Shows comments & Gene Ontology (GO) associated terms



GtoImmuPdb User Guide - Site Search



IUPHAR Guide to IMMUNOPHARMACOLOGY

Cell-mediated immunity

Search database

Search results

Page 1 of 11

Your search for **Cell-mediated immunity** returned 101 results

Order results by:

Match

Go

Ligand: **pidilizumab**

Mechanism of action: **mediated immune** checkpoint inhibition. This effects a normal

Target: **A_{2A} receptor** (Adenosine receptors)

GtoImmuPdb Process: **Cell-mediated immunity**

Target: **TEK receptor tyrosine kinase** (Type XII RTKs: TIE family of angi

GtoImmuPdb Process: **Cell-mediated immunity**

Example search results for 'Cell-mediated immunity'
Shows hit against target under
GtoImmuPdb Process category

Example search results for
'immature B cell'
Shows hit against target under
Cell Ontology Cell Type &
Definition

Search results

Your search for **immature B cell** returned 6 results

Order results by:

Match

Go

Target: **A_{2A} receptor** (Adenosine receptors)

Cell Ontology Cell Type: **immature B cell**

Cell Ontology Cell Type Definition: **immature B cell** is a **B cell** that has the phenotype surface IgM-positive and surface

Target: **S1P₁ receptor** (Lysophospholipid (S1P) receptors)

Consequences of altering gene expression: Blockade of plasma **cell** homing and **immature B cell** migration in knockout mice

Target: **FPR2/ALX** (Formylpeptide receptors, Leukotriene receptors)

Tissue distribution - tissues: **immature** dendritic **cells**, and at low levels in T and **B cells**. FPR2/ALX is also

Target: **fms related tyrosine kinase 3** (Type III RTKs: PDGFR, CSFR, Kit, FLT3 receptor family)

Tissue distribution - tissues: CD34 +ve **immature**, multipotential, myeloid and **B-lymphoid progenitor cells**, and monocytic **cells**.

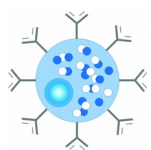
Target: **succinate receptor** (Succinate receptor)

Tissue distribution - tissues: **Immature** monocyte-derived DCs (MoDCs), macrophages, T **cells**, **B cells**

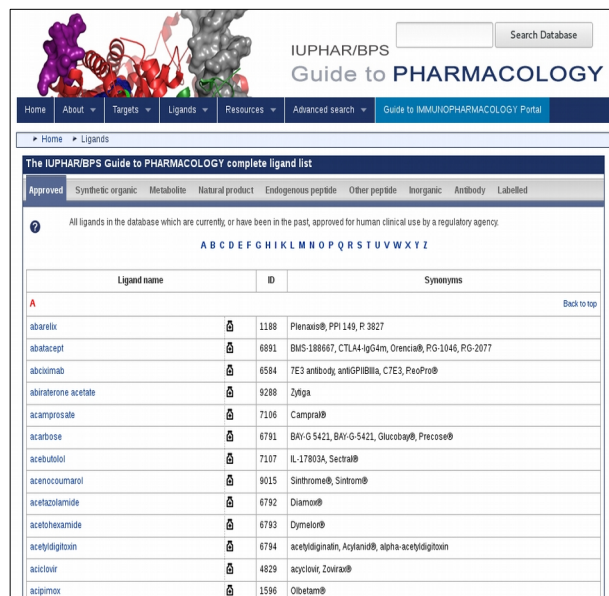
Target: **KIT proto-oncogene receptor tyrosine kinase** (Type III RTKs: PDGFR, CSFR, Kit, FLT3 receptor family)

GO Process Term: **immature B cell** differentiation

Search mechanisms have been developed to incorporate terms, IDs, comments and definitions for processes, cell types and their associations to targets.



GtoImmuPdb User Guide – Other pages & future work



The screenshot shows the IUPHAR/BPS Guide to PHARMACOLOGY website. The header includes the logo, navigation tabs (Home, About, Targets, Ligands, Resources, Advanced search, Guide to IMMUNOPHARMACOLOGY Portal), and a search bar. The main content area is titled 'The IUPHAR/BPS Guide to PHARMACOLOGY complete ligand list' and displays a table of ligands. The table has columns for Ligand name, ID, and Synonyms. The ligands listed are all approved and are currently or have been in the past approved for human clinical use by a regulatory agency. The ligands are listed in alphabetical order by their first letter (A-Z).

Ligand name	ID	Synonyms
abarelix	1188	Plenaxis®, PPI 149, P 3827
abatcept	6891	BMS-188667, CTLA4-IgG4m, Orencia®, PG-1046, PG-2077
abciomab	6584	7E3 antibody, antiGPIIb/IIIa, C7E3, ReoPro®
abiraterone acetate	9288	Zytiga
acamprosate	7106	Camprom®
acarbose	6791	BAY-G 5421, BAY-G 5421, Glucobay®, Precose®
acebutolol	7107	IL-17803A, Sectral®
acenocoumarol	9015	Sinrome®, Sintrom®
acetazolamide	6792	Diamox®
acetohexamide	6793	Dymelor®
acetyldigitoxin	6794	acetyldigitoxin, Acylamid®, alpha-acetyldigitoxin
aciclovir	4829	acyclovir, Zovirax®
acipimox	1596	Olbetam®

Currently no changes have been made to the ligand list page for GtoImmuPdb. So users see the same as you get for GtoPdb.

Other sections on the GtoImmuPdb Portal for Disease and News are currently non-functioning – but represent feature that are planned for incorporation before the beta-release in Spring 2017.

The menu-bar will be further developed so for GtoImmuPdb views the links are more relevant and provide access to information about the project and GtoImmuPdb specific help.