

Guide to IMMUNOPHARMACOLOGY

Main Portal – Access Point to Immuno Data

The Guide to IMMUNOPHARMACOLOGY (GtoImmuPdb) is a Wellcome Trust-funded extension to the existing Guide to PHARMACOLOGY (GtoPdb). The development of GtoImmuPdb aims to provide improved data exchange between immunology and pharmacology expert communities, so to better support research and development of drugs targeted at modulating immune, inflammatory or infectious components of disease.

The underlying GtoPdb schema has been extended to incorporate new immune system specific data types (such as processes and cell types) and the GtoPdb website has been developed to surface this new data and incorporate it into the existing search and browse mechanisms. A new Guide to IMMUNOPHARMACOLOGY portal has been developed, which serves as a unique immunological access-point to the Guide to PHARMACOLOGY.

<http://www.guidetoimmunopharmacology.org>

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.

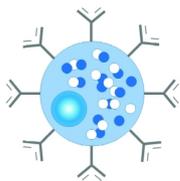
Users can familiarise themselves with the existing GtoPdb site by reading its website tutorial:

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

The guide in this document gives an overview of the 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.

<http://www.guidetoimmunopharmacology.org/immuno/immunoHelpPage.jsp#aboutData>



Guide to IMMUNOPHARMACOLOGY

Main Portal – Access Point to Immuno Data

The GtoImmuPdb portal provides a unique access point to data of immunological relevance held in the database.

The main panels (highlighted by the dotted line) are fast routes into browsing the data by the main data-type categories:

- Processes
- Cell Types
- Disease
- Targets
- Ligands

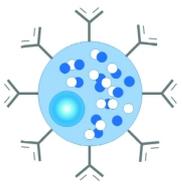
These are explained in more detail later in the tutorial. Click on the category to jump to that section.

The menu bar can also be used to browse the different data types. It also provides background information under the About tab and help documentation under Resources. These also contain information about the parent GtoPdb resource.

◀ About

Resources ▶

The site search in the top right can be used to search across all data. The predictive text feature provides suggestion. View tutorial on searching GtoImmuPdb. When searching from the Guide to IMMUNOPHARMACOLOGY results will be up-weighted based on their immuno relevance (see [Help on Searching GtoImmuPdb](#))



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Process Associations to Targets

To view targets associated with immunological processes, select a process category from the 'Processes/pathways' panel on the GtoImmuPdb portal.

You can also select a category under the Processes menu item.



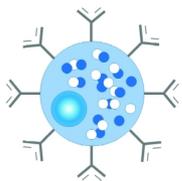
The list of targets is split by target class. The 'Jump to' links allow you to move fast to that section of the table.

The blue pull-down menu can be used to switch between different process categories

The table lists the target name (and family) and links to its detailed target page.

Gene Ontology annotations (GO) are displayed plus general curated immunopharmacology comments related to the target.

GtoPdb receptor name (family)	Process Association Comments	GO Associations	Immunopharmacology Comments
GPCRs			
CCR2 (Chemokine receptors)		<ul style="list-style-type: none"> positive regulation of T-helper 1 type immune response (GO:002827) ISS 	CCR2 is one of more than 20 distinct chemokine receptors expressed in human leukocytes. Chemokines primarily act to promote leukocyte chemotaxis to sites of inflammation. CCR2 is discussed in relation to immuno-oncology in [2] ...
CCR6 (Chemokine receptors)		<ul style="list-style-type: none"> isotype switching to IgA isotypes (GO:0048290) ISS 	CCR6 is one of more than 20 distinct chemokine receptors expressed in human leukocytes. CCR6 is expressed on a variety of immune cells including memory and regulatory T-cells [121,137] ...
CXCR5 (Chemokine receptors)		<ul style="list-style-type: none"> B cell activation (GO:0042113) IEA 	CXCR5 is one of more than 20 distinct chemokine receptors expressed in human leukocytes. Chemokines primarily act to promote leukocyte chemotaxis to sites of inflammation.
GPR183 (Class A Orphans)		<ul style="list-style-type: none"> adaptive immune response (GO:0002250) ISS B cell activation involved in immune response (GO:0002312) IBA mature B cell differentiation involved in immune response (GO:0002313) ISS positive regulation of B cell proliferation (GO:0030890) IDA 	Gpr183-deficient mice show a reduction in the early antibody response to a T-dependent antigen. GPR183-deficient B cells fail to migrate to the outer follicle and instead stay in the follicle centre [115,177] ...
Ion Channels			
nicotinic acetylcholine			



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Cell Type Associations to Targets

To view targets associated with immunological cell types, select a cell type category from the 'Cell Types' panel on the GtoImmuPdb portal.

You can also select a category under the Cell Types menu item.



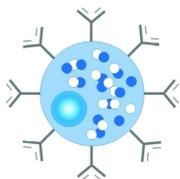
The list of targets is split by target class. The 'Jump to' links allow you to move fast to that section of the table.

The blue pull-down menu can be used to switch between different cell type categories

The table lists the target name (and family) and links to its detailed target page.

Cell Ontology annotations are displayed plus general curated immunopharmacology comments related to the target.

Targets Associated to Immuno Cell Types - Natural killer cells			
Select Immuno Cell Type category..			
Jump to: GPCR Ion Channels Enzymes Catalytic Receptors Other Protein Targets			
The <i>Natural killer cells</i> category includes the following Cell Ontology parent terms:			
natural killer cell (CL:0000623) - A lymphocyte that can spontaneously kill a variety of target cells without prior antigenic activation via germline encoded activation receptors and also regulate immune responses via cytokine release and direct contact with other cells.			
GPCRs			
GtoPdb receptor name (family)	Cell Type Association Comments	Cell Ontology Associations	Immunopharmacology Comments
5-HT_{1A} receptor (5-Hydroxytryptamine receptors)			The chemoattractant properties of 5-HT on both human and mouse mast cells are mediated by 5-HT _{1A} receptor [42] ...
CXCR3 (Chemokine receptors)		• natural killer cell (CL:0000623)	CXCR3 is one of more than 20 distinct chemokine receptors expressed in human leukocytes. Chemokines primarily act to promote leukocyte chemotaxis to sites of inflammation. CXCR3 is the receptor for CXCL9, -10 and -11, three CXC chemokines that are preferentially expressed on Th1 lymphocytes.
GPR65 (Class A Orphans)		• natural killer cell (CL:0000623)	The expression profile of GPR65 suggests an immunological role. In addition, disruption of GPR65 expression leads to reduced eosinophilia in models of allergic airway disease [41] ...
Ion Channels			
GtoPdb receptor name (family)	Cell Type Association Comments	Cell Ontology Associations	Immunopharmacology Comments
TRPM7 (Transient Receptor Potential channels)		• natural killer cell (CL:0000623)	Expressed on chicken B cells, mouse T cells, chicken monocytes/macrophages, and human mast cells [54] ...
Orai1 (Orai channels)	Orai1 is expressed by NK cells and is involved in degranulation and NK cell-mediated cytotoxicity.	• natural killer cell (CL:0000623)	<i>ORAI1</i> is the gene that encodes the essential pore-forming subunit of CRAC store-operated Ca ²⁺ entry (SOCE) channels [56] ...
Enzymes			
GtoPdb receptor name (family)	Cell Type Association Comments	Cell Ontology Associations	Immunopharmacology Comments



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Disease List

Disease association data is via the Disease List page. These are accessed by selecting the link from the Disease panel on the portal or via the Disease menu item.

The screenshot shows the IUPHAR Guide to IMMUNOPHARMACOLOGY website interface. At the top, there is a search bar and the site title. Below the navigation menu, the 'Diseases' section is active, showing a tab for 'Immuno Disease' (1). The page title is 'The IUPHAR Guide to IMMUNOPHARMACOLOGY disease list'. A question mark icon and the text 'Immunologically relevant diseases described in GtoPdb.' are present. A navigation bar with letters A through W is shown (2). The main content is a table with columns for 'Disease name', 'Synonyms', 'Targets', and 'Ligands'. The 'Allergic rhinitis' row is highlighted (3), and the 'Targets' and 'Ligands' columns are labeled (4).

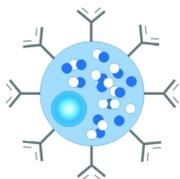
Disease name	Synonyms	Targets	Ligands
A			Back to top
Activated PI3K delta syndrome	APDS/PASLI Immunodeficiency 14 p110 delta activating mutation causing senescent T cells, lymphadenopathy, and immunodeficiency	1	3
Acute lymphocytic leukemia (ALL)	Acute lymphoblastic leukemia	3	2
Acute myeloid leukemia	Acute myelogenous leukemia	6	5
Adult T-cell leukemia	Adult T-cell leukemia/lymphoma ATLL	0	1
Allergic conjunctivitis		0	8
Allergic rhinitis (3)	atopic rhinitis hay fever Non-seasonal allergic rhinitis Perennial allergic rhinitis pollenosis seasonal allergic rhinitis	0	13
Allergic urticaria	hives	0	9
Alopecia areata	circumscribed alopecia	0	2
Anaphylactic shock	hypersensitivity reaction disease	0	1
Anaplastic large cell lymphoma		0	1
Ankylosing spondylitis	Bekhterev syndrome Marie-Strumpell disease	0	14
Aspirin exacerbated respiratory diseases		1	1
Asthma		6	77
Atopic dermatitis		2	15
Autoimmune lymphoproliferative syndrome; ALPS		1	1
Autoimmune thrombocytopenic purpura	idiopathic thrombocytopenic purpura Immune thrombocytopenia Immune thrombocytopenic purpura ITP primary immune thrombocytopenia primary thrombocytopenic purpura	0	4

The page is organised with a tab to switch (1) between the disease categories.

Diseases are listed alphabetically (2). The disease name is listed in the first column (3). This links through to more detailed information on the Disease Summary page.

Synonyms are shown in the third column.

The final two columns (4) indicated how many targets and ligands have an association to that disease.



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Disease Summary Page

Disease summary pages show an overview of the disease at the top. This can include counts of associated targets and ligands, disease descriptions, synonyms and links to external database where we have mapped our disease to.

IUPHAR Guide to IMMUNOPHARMACOLOGY

Home About Targets Ligands Processes Cell Types Diseases Resources Guide to PHARMACOLOGY

Home Diseases Psoriasis

Psoriasis

Disease ID: 801
 Name: Psoriasis
 Associated with: 4 targets
 2 immuno-relevant targets
 56 immuno-relevant ligands

Description

A long-term autoimmune disease characterized by patches of red, itchy, and scaly skin. Five types of psoriasis are recognised: plaque (psoriasis vulgaris), guttate, inverse, pustular, and erythrodermic, with plaque psoriasis being the most common type.

Database Links

Disease Ontology: [DOID:8893](#)

Target section

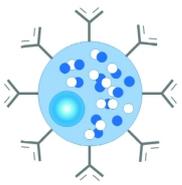
Displays any pathophysiology or mutation data curated against the target.
 Lists an ligands that are associated with the disease that interact with the target

CD2											
Comments:	CD2 is the molecular target of alefacept, a drug that was approved f										
Ligand interactions:	<table border="1"> <thead> <tr> <th>Ligand</th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>alefacept</td> <td></td> <td></td> <td></td> <td>Approved drug for plaque psoriasis (no longer authorised for use in some countries).</td> </tr> </tbody> </table>	Ligand					alefacept				Approved drug for plaque psoriasis (no longer authorised for use in some countries).
Ligand											
alefacept				Approved drug for plaque psoriasis (no longer authorised for use in some countries).							
CD6											
Comments:	CD6 is the molecular target of itolizumab, a drug approved for the treatment of chronic plaque psoriasis.										
Ligand interactions:	<table border="1"> <thead> <tr> <th>Ligand</th> <th></th> <th></th> <th></th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>itolizumab</td> <td></td> <td></td> <td></td> <td>Approved drug for chronic plaque psoriasis</td> </tr> </tbody> </table>	Ligand				Comments	itolizumab				Approved drug for chronic plaque psoriasis
Ligand				Comments							
itolizumab				Approved drug for chronic plaque psoriasis							

Ligands section

Lists associated ligands
 Icons indicate is approved drug
 Expandable comments section show, curator, clinical use and bio-activity comments

Ligands	
Key to terms and symbols Click ligand name to view	
Ligand	
AbGn-168H	
ACTH	
adalimumab	
alefacept	
<p>Immuno Disease Comments: Approved drug for plaque psoriasis (no longer authorised for use in some countries).</p> <p>Clinical Use: This drug was approved for the treatment of inflammation in moderate to severe psoriasis with plaque formation. Use of alefacept has since been discontinued in the US. View clinical data</p> <p>Bioactivity Comments: The Miller <i>et al.</i> (1993) article does not provide a calculated IC₅₀ value for LFA3TIP's inhibition of the CD2/LFA-3 interaction [38]. The inhibition is assessed by measuring rosetting of Jurkat/human red blood cells (with an approximate IC₅₀ of 1-5µg/ml of protein from graphical data in Figure 3a), or by measuring inhibition of induced T cell proliferation (with LFA3TIP inhibition at approximately 86%) [38]. View biological activity</p>	



Guide to IMMUNOPHARMACOLOGY

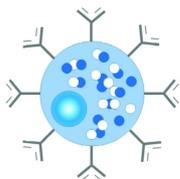
Browsing Targets in GtoImmuPdb

Users can browse for different targets by selecting one of the main target classes on the Targets panel.

◀ This links to the target families page for that class. Clicking on a family brings up the family page.

◀ The family page lists all targets for that family. There are links to the detailed view page for each target.

▶ The detailed view page shows all curated information about that target. Including highlighted immunological data



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Target Families Page

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](#)

2

Toggle GtoImmuPdb View

Expand all nodes

Collapse all nodes

GtoImmuPdb view: **ON** Families that contain targets of relevance to immunopharmacology are **highlighted in blue**

G protein-coupled receptors OVERVIEW

Orphan and other 7TM receptors OVERVIEW

- **Class A Orphans**
- Class B Orphans
- Class C Orphans
- **Opsin receptors**
- 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 receptor
- **Cannabinoid receptors**
- **Chemerin receptors**
- **Chemokine receptors**
- Cholecystokinin receptors
- Class Frizzled GPCRs
- **Complement peptide receptors**
- Corticotropin-releasing factor receptors
- **Dopamine receptors**
- Endothelin receptors
- G protein-coupled estrogen receptor
- **Formylpeptide receptors**
- **Free fatty acid receptors**
- GABA_B receptors

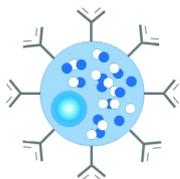
3

1

1. Target families are displayed in a hierarchical tree (as in GtoPdb)

2. The target families page contains a toggle button that can be used to switch between the GtoImmuPdb view and the normal, GtoPdb view.

3. When selected toggle on, target families that contain target flagged in the database as being of immunological relevance



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Target Family Page

The screenshot shows the IUPHAR Guide to Immunopharmacology website interface. At the top, there is a search bar and the site logo. Below the logo is a navigation menu with options: Home, About, Targets, Ligands, Processes, Cell Types, Diseases, Resources, and Guide to PHARMACOLOGY. A breadcrumb trail indicates the current location: 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).

1. GtoImmuPdb view: 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 [21]**) are activated by the endogenous ligand **adenosine** (potentially **inosine** also at A₃ receptors). Crystal structures for the antagonist-bound [13,32,54,62], agonist-bound [49-50,74] and G protein-bound A_{2A} adenosine receptors [12] have been described.

Receptors

2. Targets of relevance to immunopharmacology are **highlighted in blue**

A ₁ 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

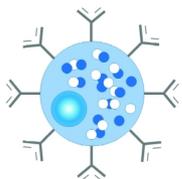
Comments

3. [Show](#) »

Further reading

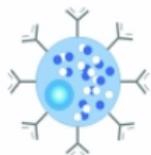
[Show](#) »

1. The family page also has a toggle to switch between GtoImmuPdb and GtoPdb
2. When switch on, target flagged as having immunological relevance are highlighted
3. Clicking the 'More detailed page' link moves to the detailed view for that target



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Target Detailed View Page



IUPHAR Guide to IMMUNOPHARMACOLOGY

 Search Database

Home About Targets Ligands Processes Cell Types Diseases Resources Guide to PHARMACOLOGY

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. Please contact us if you can help with updates. » [Email us](#)

[Toggle GtoImmuPdb View](#)

GtoImmuPdb view: **ON** : A_{2A} receptor has curated GtoImmuPdb data

1

Contents:

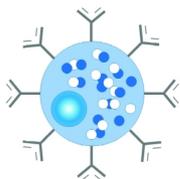
- Gene and Protein Information
- Previous and Unofficial Names
- Database Links
- Selected 3D Structures
- Natural/Endogenous Ligands
- Agonists
- Antagonists
- Immunopharmacology Comments
- Immuno Cell Type Associations
- Immuno Process Associations
- Transduction Mechanisms
- Tissue Distribution
-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

2

1. The detailed view also has a toggle, and informs the user if the displayed target has been curated in GtoImmuPdb.

2. With the GtoImmuPdb view switched on, sections of immunological relevance are highlighted within the 'Contents' section – alerting the user to them. Clicking those jumps down to those sections..

3. When selected toggle on, target families that contain target flagged in the database as being of immunological relevance



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Target Detailed View Page

Immunopharmacology Data Sections

Immunopharmacology Comments

CD80 (B7-1) is expressed on dendritic cells and activated B cells and monocytes. It is required to provide a costimulatory signal necessary for T cell activation and survival. CD80 works in concert with CD86 to prime T cells. CD80 binds CD28 and CTLA-4 on T cells. It is the interaction with CTLA-4 that is targeted by the approved immunosuppressive drugs abatacept and belatacept.

The immunopharmacology comments are rich, curator comments specific to the target about its relevance to immunopharmacology. Usually these will refer to the target's involvement with different processes, cell types and disease.

Cell Type Associations

Immuno Cell Type: [Macrophages & monocytes](#)
Cell Ontology Term: [macrophage \(CL:0000235\)](#)
[monocyte \(CL:0000576\)](#)

Immuno Cell Type: [Dendritic cells](#)
Cell Ontology Term: [dendritic cell \(CL:0000451\)](#)

Immuno Cell Type: [B cells](#)
Cell Ontology Term: [B cell \(CL:0000236\)](#)

Cell type associations show one sub-section per top-level cell type category. Associations with specific Cell Ontology terms are shown along with curator comments and references.

Immuno Process Associations

Immuno Process: [Inflammation](#)
GO Annotations: Associated to 1 GO processes
[GO:0045627](#) positive regulation of T-helper 1 cell differentiation NAS

Immuno Process: [T cell \(activation\)](#)
GO Annotations: Associated to 4 GO processes
[GO:0031295](#) T cell costimulation TAS
[GO:0042110](#) T cell activation IC
[GO:0045627](#) positive regulation of T-helper 1 cell differentiation NAS
▼ [click arrow to show/hide IEA associations](#)

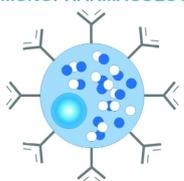
Process associations show one sub-section per top-level process category. Associations with specific Gene Ontology terms (and evidence codes) are shown along with curator comments and references.

Immuno Disease Associations

Disease Name: [Rheumatoid arthritis](#)
Disease Synonyms: *no synonyms*
Comment: CD80 is a primary target of the ligand abatacept, which is clinically approved for the treatment of rheumatoid arthritis.
Disease X-refs: Disease Ontology: [DOID:7148](#)
[OMIM: 180300](#)
References: [3](#)

Disease Name: [Allograft rejection](#)
Disease Synonyms: *no synonyms*
Comment: CD80 is a primary target of the approved anti-rejection drug belatacept.

Each sub-section gives details of the association between the target and a disease. It lists disease synonyms and curator comments. External links to other disease resources are provided.



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Ligand List Pages

Users can browse for different ligands by selecting one of the ligand categories on the Ligands panel.

Ligand categories can also be selected under the Ligands menu item.



The ligand list page is organised by category – which can be selected by the tabs at the top of the page (1).

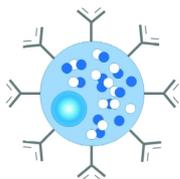
Ligands are listed alphabetically, and link to their summary pages (2). Any ligands tagged in the database as being immuno relevance display the immuno icon (3).



All immuno tagged ligands are shown under the Immuno ligands tab.

A toggle button allows switching between the GtoImmuPdb and GtoPdb views (4).

Ligand name	ID	Synonyms
A		
852A	9025	
A286982	6592	A 286982, A-286982
A438079	4118	A 438079, A-438079
abatacept	6891	BMS-188667, CTLA4-IgG4m, Orencia®, RG-1046, RG-2077
abediterol	9326	LAS-100977
AbGn-168H	10013	AbGn-168, neiulizumab
ABT-737	8320	ABT 737, ABT737, compound 2 [PMID 17256834]
AC430	9177	AC-430
acalabrutinib	8912	ACP-196, Calquence®, Example 6 [US20140155385 A1]
Ac-SDKP	10060	goralalide, seraspenside
ACT-389949	9511	
ACTH (Sp: Human)	3633	Acthar®, adrenocorticotrophic hormone (1-39), corticotropin
acumapimod	9203	BCT 197, BCT-197, BCT197, compound A [WO2013139809]
adalimumab	4860	D2E7, FKB327, Humira®
adavivint	9620	SMO-4690, SM04690
(-)-adrenaline	479	adrenalin, Auvi-Q®, Epipen®, l-adrenaline, L-epinephrine, levopinephrine
adrenomedullin (Sp: Human)	683	AM



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Ligand Summary Pages

The ligands summary pages contains detailed information about the ligand. In GtoImmuPdb.

IUPHAR

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Search Database

Home
About
Targets
Ligands
Processes
Cell Types
Diseases
Resources
Guide to PHARMACOLOGY

Home
Ligands
acalabrutinib

acalabrutinib

acalabrutinib

Ligand id: 8912

Name: acalabrutinib

Calculated Physico-chemical Properties

Hydrogen bond acceptors	9
Hydrogen bond donors	2
Rotatable bonds	6
Topological polar surface area	118.51
Molecular weight	465.19
XLogP	3.58
No. Lipinski's rules broken	0

Molecular properties generated using the CDK

Structure and Physico-chemical Properties

2D Structure

Calculated Physico-chemical Properties

Hydrogen bond acceptors	9
Hydrogen bond donors	2
Rotatable bonds	6
Topological polar surface area	118.51
Molecular weight	465.19
XLogP	3.58
No. Lipinski's rules broken	0

Molecular properties generated using the CDK

Summary
Biological activity
Clinical data
References
Structure
Immunopharmacology

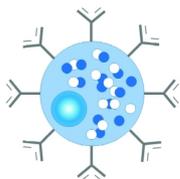
Immunopharmacology Comments

Pharmacological inhibition of BTK prevents the activation of B cells and BTK-mediated activation of downstream survival pathways. This leads to inhibition of the growth of malignant B cells overexpressing BTK.

Immunopharmacology Disease

Disease	X-Refs	Comment	References
Rheumatoid arthritis	Disease Ontology: DOID:7148 OMIM: 180300	Phase 2 clinical trial in RA completed (NCT02387762)	
B-cell chronic lymphocytic leukemia	OMIM: 151400 Orphanet: ORPHA67038	Phase 3 clinical candidate for CLL.	
Mantle cell lymphoma	Disease Ontology: DOID:0050746 Orphanet: ORPHA52416	Approved drug for MCL patients who have received at least one prior therapy.	4

1. Tagged ligands have an Immunopharmacology tab that contains immuno relevant data.
2. The immunopharmacology comments sections contains specific curators comments about the ligands relevance to immunopharmacology.
3. The immunopharmacology disease section shows all immune-related diseases the ligand is associated with, including curator comments and external references for the disease.



Guide to IMMUNOPHARMACOLOGY

Searching GtoImmuPdb

Search mechanisms have been extended to incorporate all additional immunopharmacological data – this includes all process, cell type and disease terms, definitions and ontology IDs. Running searches on GtoImmuPdb will up-weight results of higher immunological relevance.

Search results

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Your search for **regulation of cytokine production** returned 230 results

Order results by: Download as a CSV:

Target: TLR4 (Toll-like receptor family)

- GO Process Term: **regulation of cytokine production** (4 annotations to child terms)
- GO Process Term: **negative regulation of cytokine production** (5 annotations to child terms)
- GO Process Term: **positive regulation of cytokine production** (17 annotations to child terms)
- GO Process Term: **regulation of cytokine production** involved in immune response (2 annotations to child terms)
- GO Process Term: **regulation of cytokine production** involved in inflammatory response (1 annotations to child terms)
- GO Process Term: **positive regulation of cytokine production** involved in immune response (1 annotations to child terms)
- GO Process Term: **positive regulation of cytokine production** involved in inflammatory response (1 annotations to child terms)
- GO Process Term: **regulation of macrophage cytokine production** (1 annotations to child terms)
- GO Process Term: **positive regulation of macrophage cytokine production** (1 annotations to child terms)
- GO Process Term: **positive regulation of myeloid leukocyte cytokine production** involved in immune response (1 annotations to child terms)
- GO Process Term: **regulation of dendritic cell cytokine production** (1 annotations to child terms)
- GO Process Term: **regulation of tumor necrosis factor superfamily cytokine production** (3 annotations to child terms)
- GO Process Term: **negative regulation of tumor necrosis factor superfamily cytokine production** (1 annotations to child terms)
- GO Process Term: **positive regulation of tumor necrosis factor superfamily cytokine production** (2 annotations to child terms)

Target: nucleotide binding oligomerization domain containing 2 (NOD-like receptor family)

- GO Process Term: **regulation of cytokine production** (9 annotations to child terms)
- GO Process Term: **positive regulation of cytokine production** (4 annotations to child terms)
- GO Process Term: **regulation of cytokine production** involved in immune response (1 annotations to child terms)
- GO Process Term: **regulation of cytokine production** involved in inflammatory response (1 annotations to child terms)
- GO Process Term: **positive regulation of cytokine production** involved in immune response (1 annotations to child terms)
- GO Process Term: **positive regulation of cytokine production** involved in inflammatory response (1 annotations to child terms)
- GO Process Term: **regulation of dendritic cell cytokine production** (1 annotations to child terms)
- GO Process Term: **positive regulation of dendritic cell cytokine production** (1 annotations to child terms)

Example search results for 'regulation of cytokine production' shows hits against targets under the GtoImmuPdb process category 'Cytokine production & signalling'.

Search results

Page 1 of 24

Your search for **granulocytes** returned 234 results

Order results by: Download as a CSV:

Target: Fc fragment of IgE receptor 1a (Fc epsilon receptors)

- GO Process Term: **granulocyte** macrophage colony-stimulating factor production (1 annotations to child terms)
- GO Process Term: **regulation of granulocyte** macrophage colony-stimulating factor production (1 annotations to child terms)
- GO Process Term: **granulocyte** macrophage colony-stimulating factor biosynthetic process (1 annotations to child terms)
- GO Process Term: **positive regulation of granulocyte** macrophage colony-stimulating factor production (1 annotations to child terms)
- GO Process Term: **regulation of granulocyte** macrophage colony-stimulating factor biosynthetic process (1 annotations to child terms)
- GO Process Term: **positive regulation of granulocyte** macrophage colony-stimulating factor biosynthetic process (1 annotations to child terms)
- Immuno Cell Type Term: **Granulocytes**
- Immuno Cell Type Definition: **Granulocytes** category includes the following Cell Ontology parent terms: **granulocytes** (CL:0000094) - A leukocyte with
- CO Cell Type: **granulocyte** (2 annotations to child terms)

Target: death associated protein kinase 2 (Death-associated kinase (DAPK) family)

- Physiological function - description: regulates motility of **granulocytes** in response to intermediary but not end-target chemoattractants ex vivo.
- GO Process Term: **granulocyte** migration (3 annotations to child terms)
- GO Process Term: **granulocyte** chemotaxis (2 annotations to child terms)
- GO Process Term: **regulation of granulocyte** chemotaxis (2 annotations to child terms)
- GO Process Term: **positive regulation of granulocyte** chemotaxis (2 annotations to child terms)
- Immuno Cell Type Term: **Granulocytes**
- Immuno Cell Type Definition: **Granulocytes** category includes the following Cell Ontology parent terms: **granulocytes** (CL:0000094) - A leukocyte with
- CO Cell Type: **granulocyte** (1 annotations to child terms)
- Celltype Association Comment: DAPK2 is the prevailing DAPK family member in **granulocytes**.

Target: spleen associated tyrosine kinase (Syk family)

- GO Process Term: **granulocyte** activation (2 annotations to child terms)
- GO Process Term: **granulocyte** migration (1 annotations to child terms)

Example search results for 'Granulocytes' shows hits against targets under the GtoImmuPdb cell type category 'Granulocytes'.