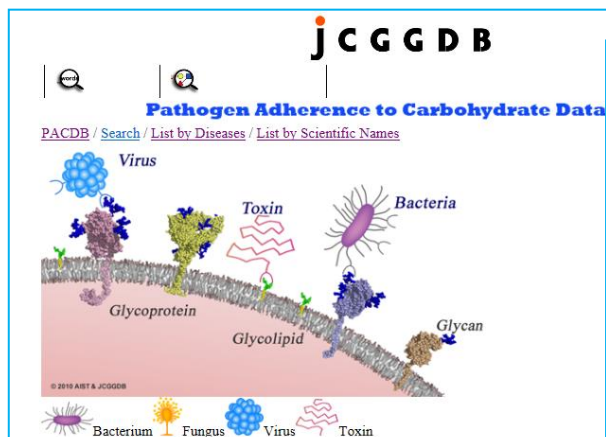


The **Pathogen Adherence to Carbohydrate Database (PACDB)** was created by **Research Center for Medical Glycoscience (RCMG)** and released in **March 2010**. This database is supported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) as part of “Life Science Integrated Database project”.

At present time PACDB provides information on about 370 strains of 127 microorganisms, and about 1700 lectin-glycan interactions, such as binding or not binding. Also, the PACDB provides information on 97 infectious diseases in which the interaction between adherence molecules of infectious agents and glycan ligands of the host cells plays an important role in the disease pathogenesis. All of the information for the creation of this database was obtained from the 214 scientific articles. The Web-based user interface was created and released and now available at <http://icggdb.jp/search/PACDB.cgi>.



Pathogen Adherence to Carbohydrate DB

This database provides the information on pathogens (e.g. bacteria, fungus, toxin and virus) adhered to the cell surface of host animals or plants. Many pathogens have been reported to recognize the cell surface of host cells as a first step of bacterial adhesion and infection. We have also collected the data of bacterial infections to host tissues.

This database will give you easy access to the data on each pathogen and its receptor glycans or proteins.

We hope that this database could be of help in your study and serve as a bridge for two areas of study: infectious diseases



Project Members

Masako Maeda, RCMG, AIST

Mihou Fushimi (Graphic Design), RCMG, AIST.

Toshihide Shikanai, RCMG, AIST.

Hisashi Narimatsu, RCMG, AIST.

JCGGDB

English
日本語

Pathogen Adherence to Carbohydrate Database

PACDB / [Search](#) / [List by Diseases](#) / [List by Scientific Names](#)

Disease
Please select Disease Name









Species
Escherichia coli

Escherichia coli

Digestive System Disease / Diarrhea
Inflammation / Sepsis


was caused by Escherichia coli (31A/06) Infections


PACDB REF. ID	Pathogen Adherence Molecule	Glycan/Glycoprotein Ligand
74	Fimbria:20K-fimbriae	Human colon carcinoma Caco-2 cell line GlcNAc sequence GlcNAc [Binding] Edit











Escherichia coli (346)

PACDB REF. ID	Pathogen Adherence Molecule	Glycan/Glycoprotein Ligand
57	Fimbria:Type 1-fimbriae	Patient with urinary tract infection Glycoside p-nitrophenyl [alpha]-D-mannopyranoside [Binding] Edit
57	Fimbria:Type 1-fimbriae	Patient with urinary tract infection Synthetic branched oligosaccharides 15 Man(a1-3)Man(b1-4)GlcNAc [Binding] Edit
57	Fimbria:Type 1-fimbriae	Patient with urinary tract infection Synthetic branched oligosaccharides 22, Man(a1-3)[Man(a1-6)]Man(a1-6)Man(a1-3)Man Man(a1-3)[Man(a1-6)]Man(a1-6)[Man(a1-3)]Man [Binding] Edit
57	Fimbria:Type 1-fimbriae	Patient with urinary tract infection Synthetic branched oligosaccharides 23, Man(a1-3)[Man(a1-6)]Man(a1-6)[Man(a1-2)]Man(a1-3)Man Man(a1-3)[Man(a1-6)]Man(a1-6)[Man(a1-2)Man(a1-3)]Man [Binding] Edit
57	Fimbria:Type 1-fimbriae	Patient with urinary tract infection [beta]-D-glycoside [Binding] Edit







English 日本語

Pathogen Adherence to Carbohydrate Database

[PACDB / Search / List by Diseases / List by Scientific Names](#)

Diseases	Please select Disease Name	<input type="button" value="▼"/>
Species	Please select Taxonomy Name	<input type="button" value="▼"/>

PACDB REF. ID	PMID/DOI	Article title
28	P:12640352	Bacterial adhesins and the role of sialic acid in bacterial adhesion. <i>Med. Sci. Monit.</i> 2003 Mar;9(3):RA76-82

PACDB REF. ID	Pathogen Adherence Molecule	Glycan/Glycoprotein Ligand
26	<i>Bordetella pertussis</i> Inclusion Protein Pertactin	Interleukin [Binding]
26	<i>Bordetella pertussis</i> Adhesin FHA (filamentous hemagglutinin)	Galactose on sulfated glycolipids
26	<i>Enterococcus faecalis</i> Adhesin EFAsA (I-ary family)	Gal [Binding]
26	<i>Enterococcus faecalis</i> Adhesin EFAsA (I-ary family)	L-Fucose containing residues
26	<i>Enterococcus faecalis</i> Adhesin EFAsA (I-ary family)	Fuc [Binding]
26	<i>Enterococcus faecalis</i> Adhesin EFAsA (I-ary family)	D-Galactose containing residues
26	<i>Escherichia coli</i> Adhesin FimH	Gal [Binding]
26	<i>Escherichia coli</i> Adhesin Pili	Eukaryotic cells Mannose oligosaccharides
26	<i>Escherichia coli</i> Adhesin PaCG	N-gan [Binding]
26	<i>Escherichia coli</i> Adhesin PrG	Gal(a)-XGal in rhicolipids
26	<i>Escherichia coli</i> Adhesin PrG	Gal(a)-XGal [Binding]
26	<i>Escherichia coli</i> Adhesin PrG	Gal(a)-XGal in rhicolipids
26	<i>Escherichia coli</i> Adhesin PrG	Gal(a)-XGal [Binding]
26	<i>Escherichia coli</i> Adhesin SfaR	Al-sialyl-2-3-b-galactose [Binding]
26	<i>Haemophilus influenzae</i> Adhesin HfB (Pii family)	NeAc-Gc-GM1 [Binding]
26	<i>Haemophilus influenzae</i> Adhesin Hfa	Human conjunctival cells (respiratory tract) Oligosaccharides rich in sialic acid [Binding]
26	<i>Haemophilus influenzae</i> Adhesin HMW1	Human epithelial cells Oligosaccharides rich in sialic acid [Binding]
26	<i>Haemophilus influenzae</i> Adhesin HMW2	Human epithelial cells Oligosaccharides rich in sialic acid [Binding]
26	<i>Klebsiella pneumoniae</i> Pili-MAD-pili	Mucosal surface of the gastric epithelium Fucosylated Lch histo-blood group antigens [Binding]
26	<i>Nisseria gonorrhoeae</i> Pili-X-methylglyoxyl-amine pili	Collagen (type VI) [Binding]
26	<i>Staphylococcus aureus</i> Adhesin FhuB	Glucosamine-galactose carbohydrate [Binding]
26	<i>Staphylococcus aureus</i> Adhesin FhuA	Fibronectin [Binding]
26	<i>Streptococcus crista</i> Adhesin SCA (I-ary family)	Fibronectin [Binding]
26	<i>Streptococcus pyogenes</i> Adhesin SpA (Antigen I/II)	Actinomycetes [Binding]
26	<i>Streptococcus pyogenes</i> Adhesin SpA (Antigen I/II)	Saliva Salivary glycoprotein [Binding]

Ontologies for genetic and infectious diseases known to be related to glycan metabolism and glycan binding

GGDonto ontology

GDGDB ontology

PAConto ontology

Ontology and RDF representation of the data from the Pathogen Adherence to Carbohydrate Database

[Introduction](#) | [GGDonto & GDGDB ontologies](#) | [PAConto ontology](#) | [Link to databases](#)

PAConto ontology

User Interface

- SPARQL-based

RDF and documentation files

- Ontology description and definition of classes and properties in [RDF/XML](#)
- Ontology description and definition of classes and properties in [RDF/Turtle](#)
- Data in [RDF/XML](#)
- Documentation in [Microsoft Word](#)



Web page in that the RDF files and the user interface are provided

```

<rdf:xml:base href="http://jcgdb.jp/rdf/diseases/paconto-schema">
<!-- Ontology description -->
<owl:Ontology rdf:about="http://jcgdb.jp/rdf/diseases/paconto-schema">
  <owl:versionInfo xml:lang="en">v.1.0</owl:versionInfo>
  <dc:title xml:lang="en">
    Pathogen Adherence to Carbohydrate DataBase (PACDB) and Ontology (PAConto)
  </dc:title>
  <dc:description xml:lang="en">
    PAConto is the ontology and RDF representation of the data from the Pathogen Adherence to Carbohydrate DataBase (PACDB).
    PACDB was created by Research Center for Medical Glycoscience (RCMG) and released in April 2010. PACDB provides information
    on about 1700 lectin-glycan interactions. Also, the PACDB provides information on pathogenic microorganisms, glycan ligands, and on
    about 100 infectious diseases, in the pathogenesis of which the interaction of microbial glycan-binding proteins and glycans with host
    glycan ligands plays an important role.
  </dc:description>
  <dc:source xml:lang="en">
    Pathogen Adherence to Carbohydrate DataBase (PACDB). http://jcgdb.jp/search/PACDB.cgi
  </dc:source>
  <dc:contributor xml:lang="en">
    National Institute of Advanced Industrial Science and Technology, Biotechnology Research Institute for Drug Discovery, Glycoscience
    and Glycotechnology Research Group
  </dc:contributor>
  <dc:creator xml:lang="en">Elena Solovieva</dc:creator>
  <dc:creator xml:lang="en">Toshiede Shikana
  <dc:creator xml:lang="en">Norikazu Fujita</dc:
  <dc:creator xml:lang="en">Hiasshi Narimatsu
  <dc:publisher>http://jcgdb.jp/</dc:publisher>
  <dc:license rdf:resource="http://creativecommons.org/licenses/by/4.0/">
  <owl:imports rdf:resource="http://jcgdb.jp/rdf/diseases/paconto-schema">
  <owl:imports rdf:resource="http://jcgdb.jp/rdf/diseases/paconto-schema">
  </owl:ontology>
<!-- Concept Schemes description -->
+<rdf:Description rdf:about="#PACDB:conceptSchemes">
<!-- Creation of new Classes -->
+<owl:Class rdf:about="#Microorganism"></owl:Class>
+<owl:Class rdf:about="#DiseasesPACDB"></owl:Class>
+<owl:Class rdf:about="#DiseasesClassificationsM"></owl:Class>
+<owl:Class rdf:about="#ReferencesPACDB"></owl:Class>
+<owl:Class rdf:about="#TargetTissuesAndCells"></owl:Class>
+<owl:Class rdf:about="#MicrobialGlycanBindingProteins"></owl:Class>
+<owl:Class rdf:about="#GlycansPACDB"></owl:Class>
+<owl:Class rdf:about="#LigandsStructuralFeaturesPACDB"></owl:Class>
+<owl:Class rdf:about="#StructuralPartNamesPACDB"></owl:Class>
+<owl:Class rdf:about="#PathogenicGlycansPACDB"></owl:Class>
+<owl:Class rdf:about="#OrganismForm"></owl:Class>
+<owl:Class rdf:about="#SemanticTypesPACDB"></owl:Class>
+<owl:Class rdf:about="#ConnectionsPACDB"></owl:Class>
+<owl:Class rdf:about="#TroisismPACDB"></owl:Class>

```

RDF file:
paconto-schema.rdf

Diagram showing the structure of ontology

RDF file:
paconto-schema.rdf

Diagram showing the structure of ontology

RDF representation of the PACDB data

PACDB

PAConto ontology

RDF

Classifications

JCGGDB
(Glycan ID, Motif ID)

Internal information resources:
GlycoEptope database

GlycoEpitope DB

External information resources:
MonosaccharideDB database

MonosaccharideDB

MeSH

UMLS

NGIT

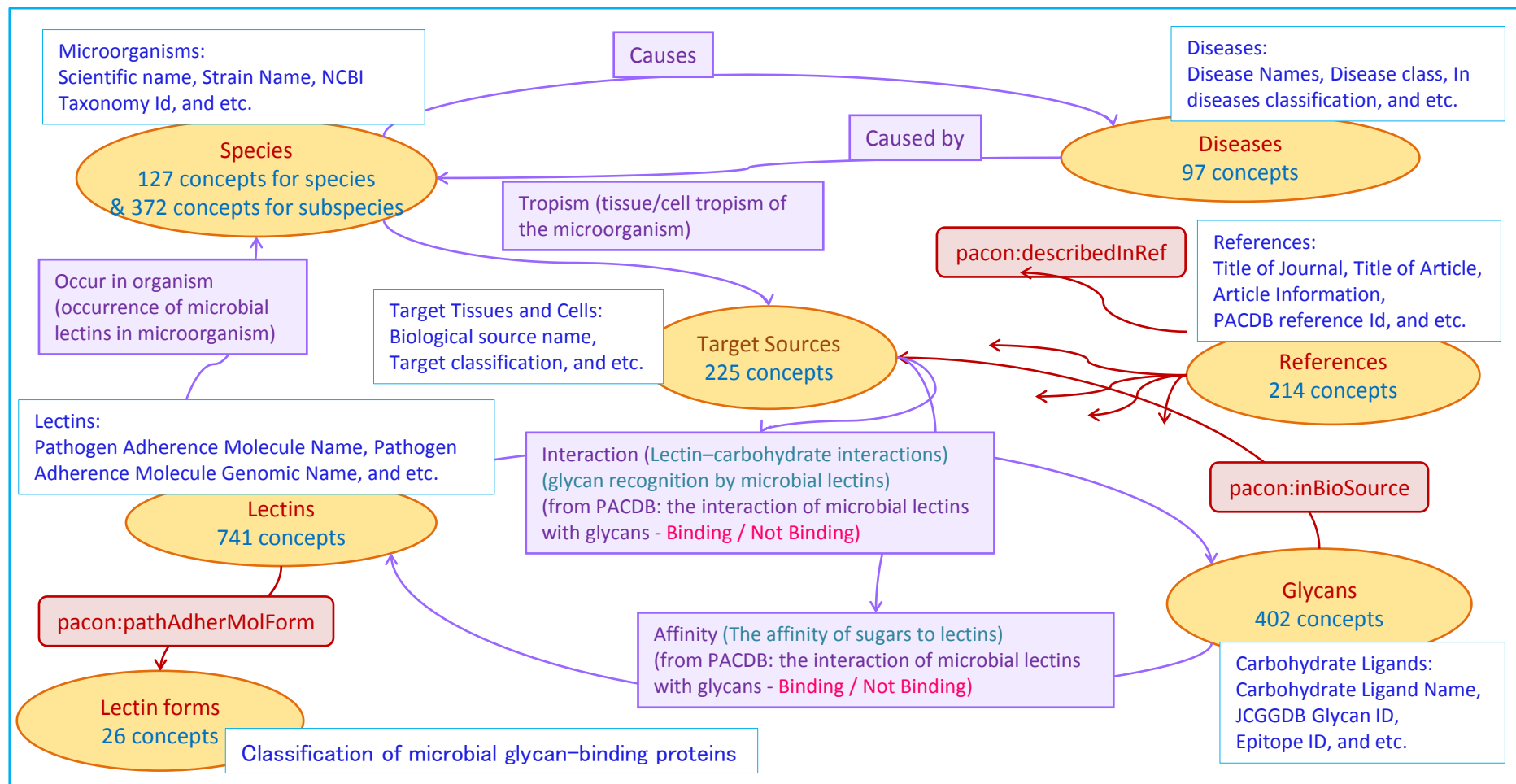
NCBI Taxonomy

PAConto ontology

Structure of the ontology

Features of this ontology

- On the basis of the scientific literature, we described semantics of PACDB data by adding various classifications, such as classifications of pathogenic microorganisms (pathogens), microbial glycan-binding proteins, target sources and host glycan ligands.
- PACDB database is the database created on the basis of the references in which the data are based on biological experiments. Since the data obtained from these experiments are numerous and complicated, PAConto ontology has the complicated structure.



Changing the Layout of the List of Microorganisms Menu for changing the layout of the list Different layout of the list (grouped and ungrouped)

List of Pathogenic Microorganisms Number of items in the list

Facets sets: Faceted browsing and filtering

- Diseases Classifications
- Species
- Microbial Glycan-Binding Proteins Types
- Glycans and Glycoconjugates Types
- Monosaccharides (mainly for the mono- or disaccharide ligands and glycoepitopes)
- Glycoepitopes
- Structural Features of Carbohydrate Ligands
- Diseases
- Target sources
- Pathogen Adherence Molecules

ACGG-DB Pathogen Adherence to Carbohydrate DataBase (PACDB) and Ontology (PAConto)

445 List of Microorganisms

sorted by: ScientificName and StrainName; then by... ☒ grouped as sorted

Actinobacillus pleuropneumoniae (2)

1. *Actinobacillus pleuropneumoniae* serovar 1 str. 4074 (strain)
[Pathogen Adherence Molecules] LPS
2. *Actinobacillus pleuropneumoniae* serovar 2 str. 4226 (strain)
[Pathogen Adherence Molecules] LPS

Actinomyces naeslundii (23)

1. *Actinomyces naeslundii*
[Pathogen Adherence Molecules] bacterial glycan-binding proteins:Unknown and fimbriae:Type 2-fimbriae
2. *Actinomyces naeslundii* ATCC 12104 (strain)
[Pathogen Adherence Molecules] bacterial glycan-binding proteins:Unknown and fimbriae:Type-2 fimbrial lectins (130-kDa glycoprotein)
[Diseases] Stomatognathic Disease/Oral Infection and Stomatognathic
3. *Actinomyces naeslundii* genospecies 1 str. B-1-L (strain)
[Pathogen Adherence Molecules] fimbriae:Type 2-fimbriae
4. *Actinomyces naeslundii* genospecies 1 str. B-2-G (strain)
[Pathogen Adherence Molecules] fimbriae:Type 2-fimbriae
5. *Actinomyces naeslundii* genospecies 1 str. P-10-A (strain)
[Pathogen Adherence Molecules] fimbriae:Type 2-fimbriae

Search

PACDB provides information about the diseases, in the pathogenesis of which the interaction of microbial glycan-binding proteins and glycans with host glycan ligands plays an important role.

(sys_mesh) Classification of Diseases by Systems using MeSH (Medical Subject Headings) vocabulary
(pathog_mesh) Classification of Diseases by Pathogens using MeSH
(anim_mesh) Classification of Animal Infectious Diseases using MeSH

Diseases Classifications

250 (sys_mesh) Diseases by Systems ▶
156 (pathog_mesh) Diseases by Pathogens ▶
19 (anim_mesh) Animal Infectious Diseases ▶
182 (others)

Diseases

182 (missing this field)
5 Acquired Immunodeficiency Syndrome (AIDS)
1 Amebiasis
1 Amebic Dysentery
1 Atrophic Gastritis

Species

256 Bacteria ▶
28 Eukaryota ▶
117 Viruses ▶
3 (others)

Target sources

19 Disease, Disorder or Finding ▶

To detailed Information about Microbial Glycan-Binding Protein and Host Glycan Ligand

Detailed Information about Microbial Glycan-Binding Protein and Host Glycan Ligand that correspond to one Lectin-Glycan Interaction obtained from selected Article

Article Information and PMID

Facets sets:
Faceted browsing and filtering

ACGG-DB Pathogen Adherence to Carbohydrate DataBase (PACDB) and Ontology (PAConto)

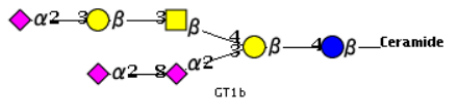
Reference: Microbial recognition of human cell surface glycoconjugates. Curr. Opin. Struct. Biol. 2008 Oct;18(5):567-76
PMID: 18809496

Species: 2 Clostridium tetani, 4 Escherichia coli
Strain: 1 Influenza A virus, 1 Influenza B virus, 1 Murine
Lectin Type: 3 bacteria adhesins, 3 bacterial glycan-binding proteins
Lectin Name: 3 Capsid proteins, 1 Capsid VP1, 1 Cholera toxin
Ligand Type: 3 Glycoconjugates, 1 Glycosphingolipids
Ligand Name: 1 Blood group A antigen, 1 Blood group A antigen analog, 1 Blood group B antigen

Changing the Layout of the List

19 List of Interactions between Glycan and Pathogen Adherence Molecule.

sorted by: Species; then by... • grouped as sorted

Scientific Name	Clostridium tetani	Pathogen Adherence Molecule	Binding	✓
Type and Name	toxins (exotoxins):Tetanus toxin (Hc fragment)	Genomic Name		
Glycan/Glycoconjugate Ligand				
Ligand Name	GT1b analog	Target Source	Synapse	
Glycan Sequence				
Ligand Features	Trisialoglycosphingolipids / Neu5Ac	Epitope	GT1b	
GLYCAN ID (JCGGDB)		MOTIF ID (JCGGDB)	JCGG-MOTIF4055	
				

Scientific Name	Clostridium tetani	Pathogen Adherence Molecule	Binding	✓
Type and Name	bacterial glycan-binding proteins:Unknown	Genomic Name		
Glycan/Glycoconjugate Ligand				
Ligand Name	GT1b analog	Target Source	Synapse	
Glycan Sequence				
Ligand Features	Trisialoglycosphingolipids / Neu5Ac	Epitope	GT1b	
GLYCAN ID (JCGGDB)		MOTIF ID (JCGGDB)	JCGG-MOTIF4055	

Interaction between lectin and glycan

Information about Interaction between lectin and glycan

- Scientific Name(Microorganisms)
- Pathogen Adherence Molecule(Type and Name, Genomic Name) • Binding
- Ligand Name • Target Source • Ligand Features • Glycan Sequence • Epitope
- JCGGDB-ID • MOTIF-ID(on JCGGDB) • Size of Glycan