SOKA University

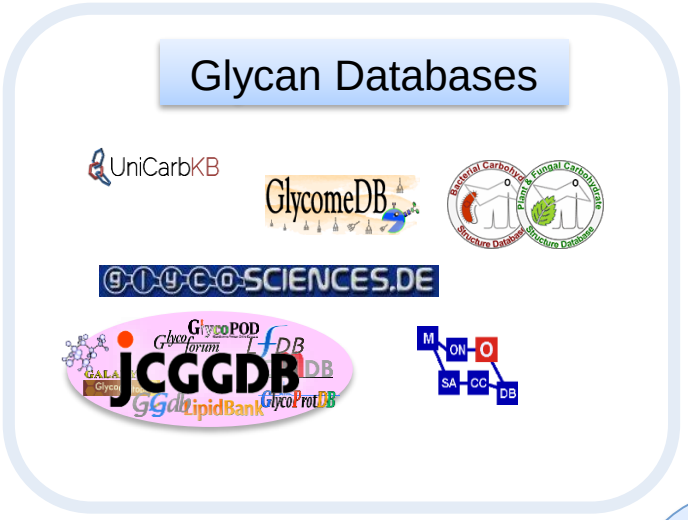
Discover your potential

GlyTouCanの更新および GlyCosmos Portalの公開

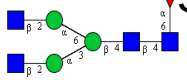
木下聖子

2019年12月3日

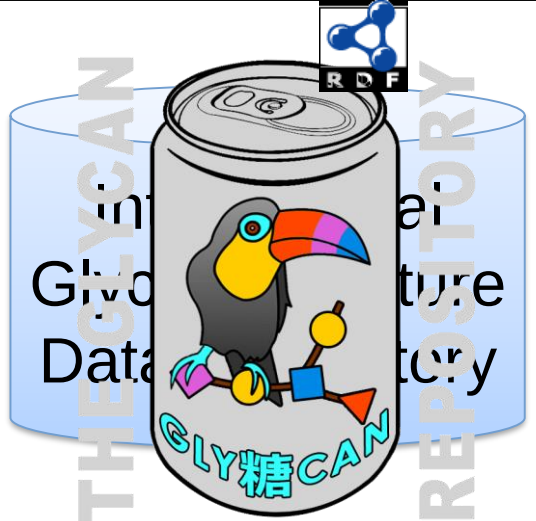
第42回日本分子生物学会年会



Unique Glycan ID + Structure Data

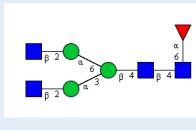


Sharing

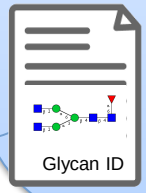


④Curation

Annotation Data

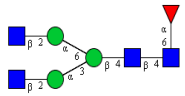


Knowledge-Sharing of Glycan Knowledge via Internet

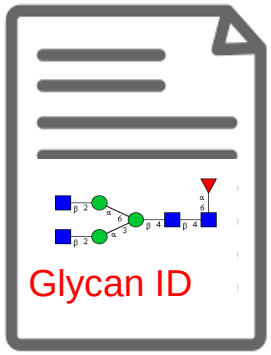


② Obtain Unique Glycan ID

① Structure Registration



Glycan Research



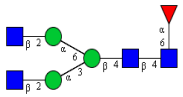
Research Paper

③Manuscript submission

MIRAGE

New GlyTouCan 3.0 (August, 2019)

SOKA University



Register

Translated

Assign

GlyTouCan ID

Instant assignment of structures:

- Input data limited to GlycoCT & WURCS
- Only simple verification of accuracy
- Structures registered simultaneously could be duplicated

Batch Processing Phase:

- Validates inputted data
- Generates images
- Assigns ID

User Profile Page:

- Validation results
- Images
- Assigned ID

Advantages:

- Input data can be anything translatable to WURCS (GlycanFormatConverter)
- Validation status can be viewed on Profile Page
- Structure duplication can be avoided

GlyCosmos Overview

SOKA University

Repositories

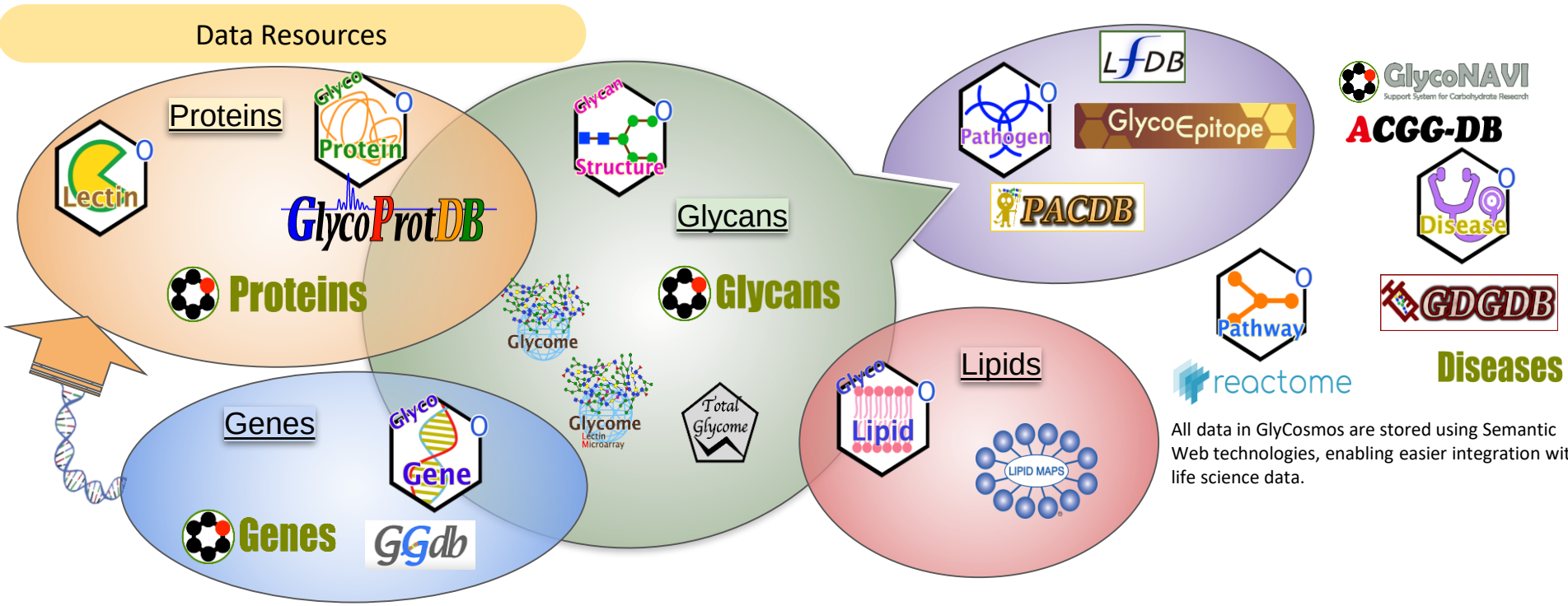
The glycan structure repository GlyTouCan
assigns accession numbers to glycans

The glyco(proteo)mics repository GlycoPOST
stores mass spectrometry data obtained from glyco-(proteo)mics related experiments.

The Glycoconjugate repository GlyComb (TBA)
will assign accession numbers to glycoconjugates such as glycoproteins, glycolipids

UniProt ID/Lipid MAPS ID + glycosylation site + GlyTouCan ID

Data Resources



All data in GlyCosmos are stored using Semantic Web technologies, enabling easier integration wit life science data.

GlyCosmos

正式に日本糖質学会のオフィシャルポータルとして承認
本年4月1日に公開

Submissions:

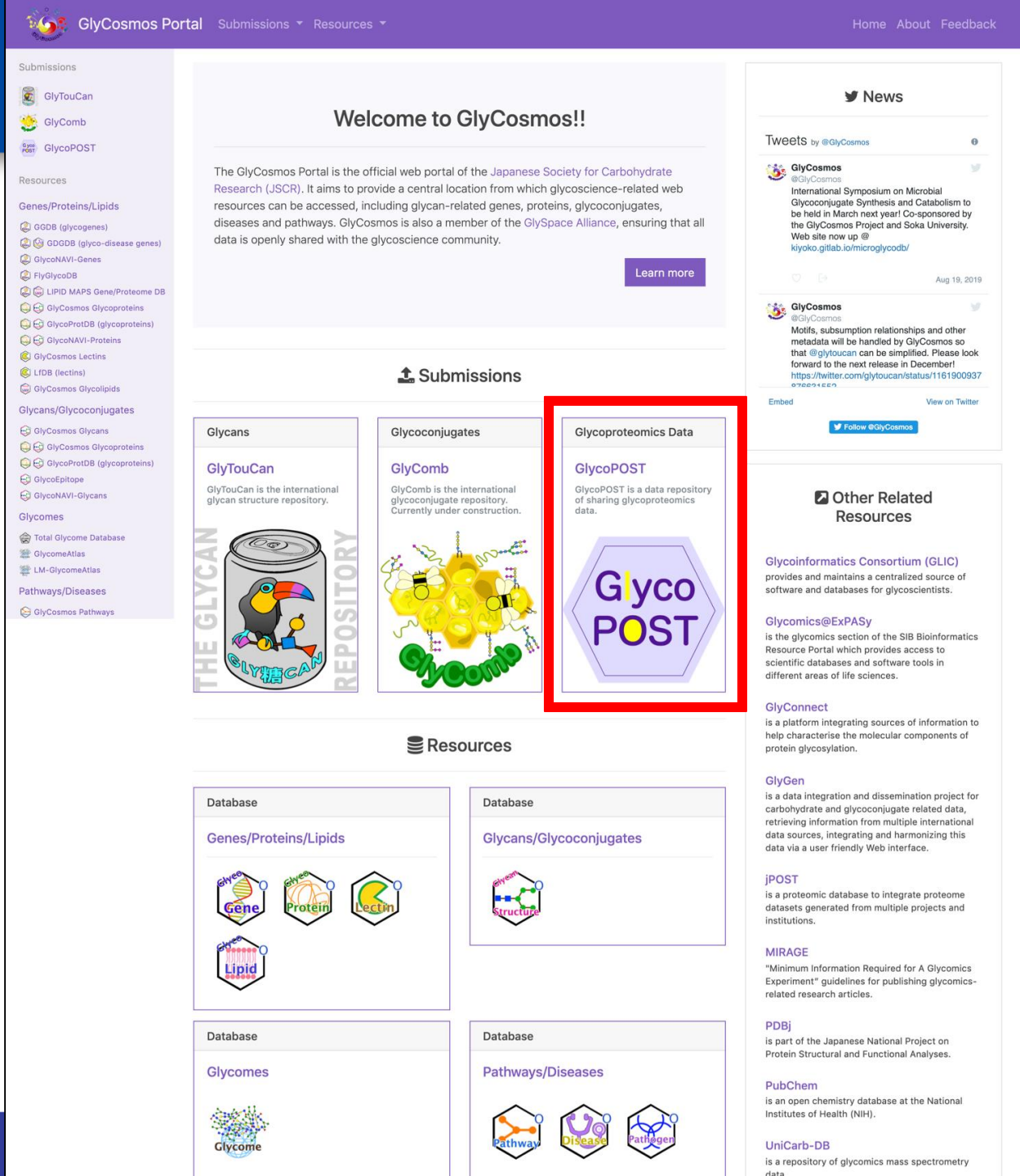
- GlyTouCan
- GlyComb (開発中)
- GlycoPOST

Resources:

- Genes/Proteins/Lipids
- Glycans/ Glycoconjugates
- Glycomes
- Pathways/Diseases
- Ontologies
- Notations

Release 2:
August 5, 2019

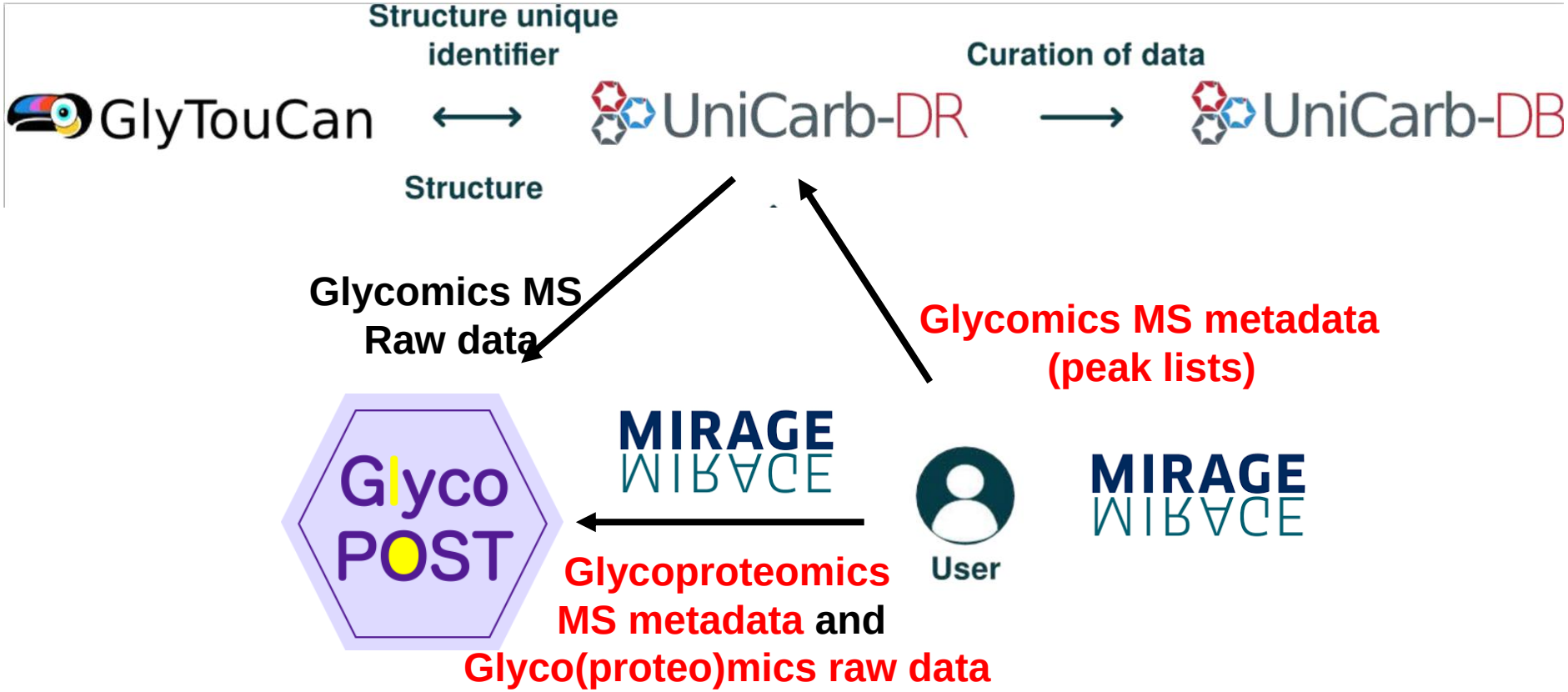
Release 3:
December 12, 2019



GlycoPOST

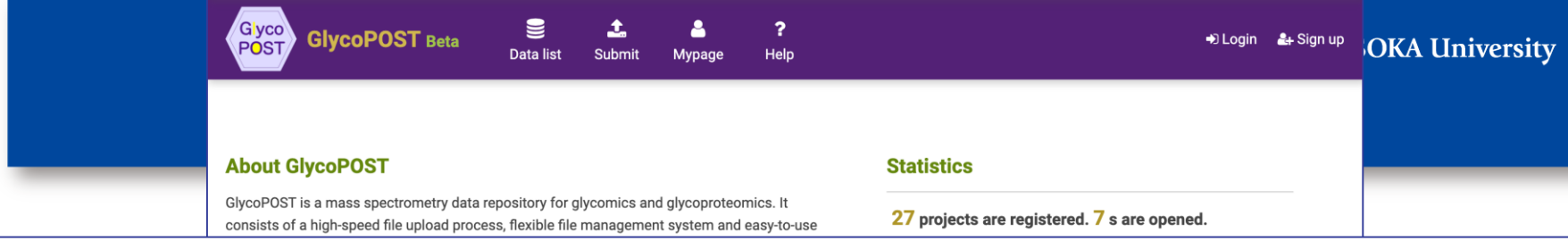
SOKA University

Aoki-Kinoshita, K.F., Karlsson N. et al. Towards a standardized bioinformatics infrastructure for N-and O-glycomics. *Nature communications*, *10*(1), pp.1-10, 2019.



MCP MOLECULAR & CELLULAR PROTEOMICS

nature methods



Data list

ID	Project title	Description	Publication	Principal investigator	Announcement date	Detail
GPST000038	UniCarb-DR	Data from UniCarb-DR	31332201	Niclas G. Karlsson	2019/10/02	Detail page
GPST000027	GnT3 KO mouse brain	Bisecting GlcNAc is a general suppressor of terminal modification of N-glycan	31375533	Miyako Nakano	2019/09/21	Detail page
GPST000031	GnT3 KO mouse kidney	Bisecting GlcNAc is a general suppressor of terminal modification of N-glycan	31375533	Miyako Nakano	2019/09/21	Detail page
GPST000030	Reference glycan structure libraries of primary human cardiomyocytes and pluripotent stem cell-derived cardiomyocytes reveal cell-type and culture stage-specific glycan phenotypes	To generate glycan structure libraries, the current study used porous graphitized carbon (PGC) LC interfaced with MS (PGC-LC-MS), a technique that resolves glycan structures and enables characterizat...		Rebekah L. Gundry	2019/08/31	Detail page
GPST000029	Standardization of PGC-LC-MS-based glycomics for sample specific glycotyping	Porous graphitized carbon (PGC) based chromatography achieves high-resolution separation of glycan structures released from glycoproteins. However, the implementation of PGC-based separations in glyco...	31065629	Nicolle H Packer	2019/06/28	Detail page
GPST000024	Discrimination of Isomers of Released N- and O-Glycans Using Diagnostic Product Ions in Negative Ion PGC-LC-ESI-MS/MS	We used porous graphitized carbon-LC-ESI-MS/MS to separate and detect released N- and O-glycan isomers from mammalian model glycoproteins using negative mode resonance activation CID-MS/MS. By interro...	29603058	Nicolle H. Packer	2019/06/28	Detail page
GPST000009	Atlantic Salmon mucus from skin, pyloric caeca and distal intestine	Diseases cause ethical concerns and economic losses in the Salmonid industry. The mucus layer comprised of highly O-glycosylated mucins is the first contact between pathogens and fish. Mucin glycans g...	30923042	Sara Lindén	2019/04/10	Detail page

GlyCosmos

Submissions:

- GlyTouCan
- GlyComb (under development)
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Resources:

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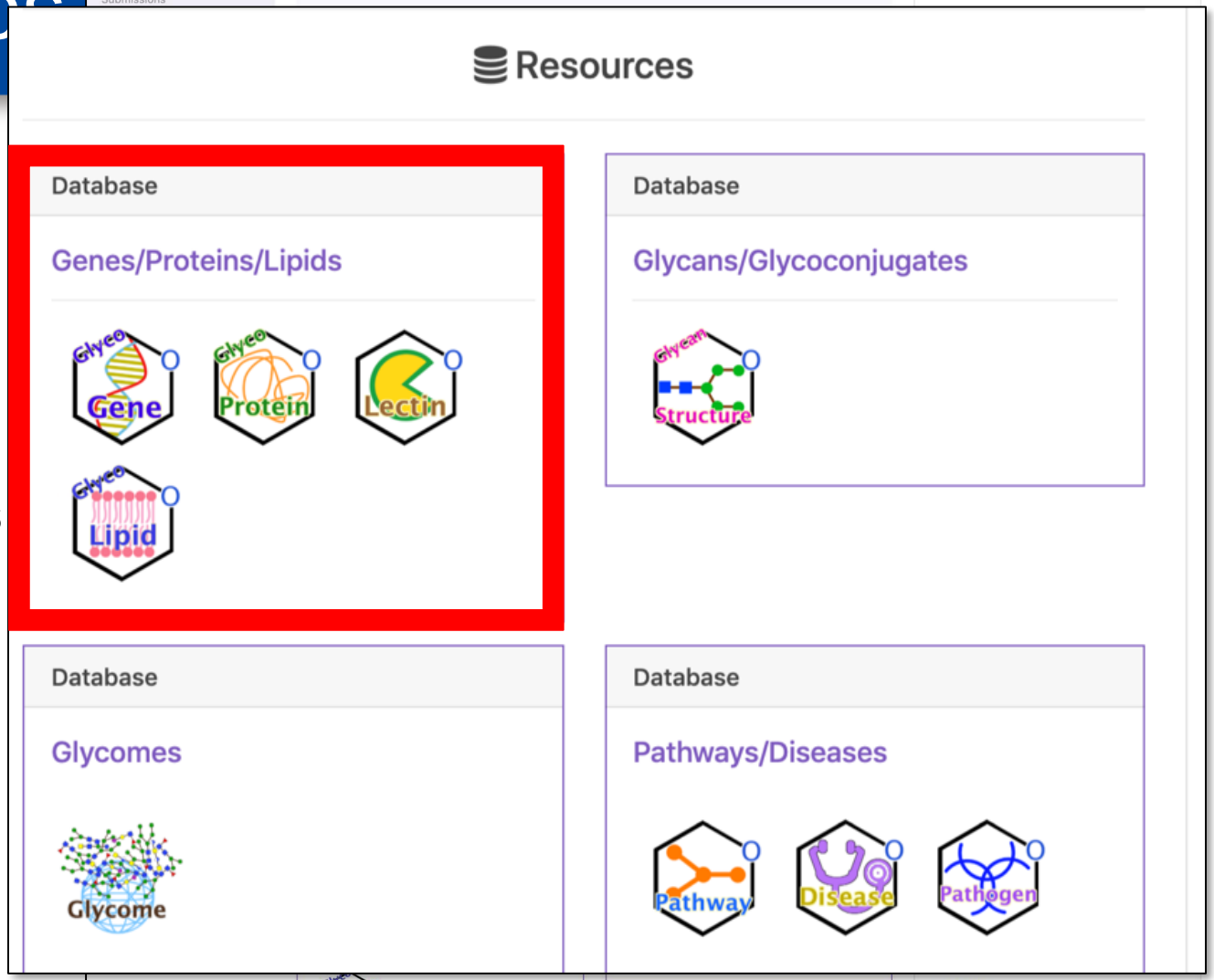

Gene

ACGG-DB

GlycoGene Database (GGDB)

GGDB is a database which includes genes associated with glycan synthesis such as glycosyltransferase, sugar nucleotide synthases, sugar-nucleotide transporters, and sulfotransferases.

— ACGG-DB

GGdb

GlycoNAVI

GlycoNAVI-Genes

GlycoNAVI-Genes is dataset of gene informtion. This is the content of GlycoNAVI. Currently under construction.

— GlycoNAVI

LIPID MAPS Gene/Proteome Database (LMPD)

LIPID MAPS Gene/Proteome Database (LMPD)

Lipid-related genes and proteins entry from LIPID MAPS.

Proteins

GlyCosmos Database

GlyCosmos Glycoproteins

Glycoprotein entries from UniProt. Glycosylation site information is also shown where available.

GlyCosmos Database

GlyCosmos Lectins

Protein entries from PDB annotated as lectins in UniProt. Glycosylation site information is also shown where available.

ACGG-DB

GlycoProtDB (GPDB)

GPDB is a glycoprotein database providing information of Asn (N)-glycosylated proteins and their glycosylated site(s), which were constructed by employing a bottom-up strategy using actual glycopeptide sequences identified by LC/MS-based glycoproteomic technologies.

— ACGG-DB

GlycoProtDB

ACGG-DB

Lectin Frontier DataBase (LfDB)

LfDB provides quantitative interaction data in terms of the affinity constants (Ka) of a series of lectins toward a panel of pyridylaminated (PA) glycans obtained by an automated frontal affinity chromatography with fluorescence detection (FAC-FD) system.

— ACGG-DB

LfDB

GlycoNAVI

GlycoNAVI-Proteins

GlycoNAVI-Proteins is dataset of glycan and protein informtion. This is the content of GlycoNAVI. Currently under construction.

— GlycoNAVI

Lipids

GlyCosmos Database

GlyCosmos Glycolipids

Glycolipid entry from LIPID MAPS.

Expression

J. Biol. Chem. 1990 Jan 15;265(2):1139-45.

Isolation to homogeneity and partial characterization of a histo-blood group A defined Fuc alpha 1----2Gal alpha 1----3-N-acetylgalactosaminyltransferase from human lung tissue.

Clausen H. et al. PMID:2104827

Vox Sang. 1986 null ;51(3):161-71.

Genetics of ABO, H, Lewis, X and related antigens.

Oriol R. et al. PMID:2433836

Vox Sang. 1989 null ;56(1):1-20.

ABH and related histo-blood group antigens; immunochemical differences in carrier isotypes and their distribution.

Clausen H. et al. PMID:2464874

Semin. Hematol. 1981 Jan ;18(1):39-62.

Blood group ABH and Ii antigens of human erythrocytes: chemistry, polymorphism, and their developmental change.

Hakomori S. PMID:6782678

kidney lung

Biological Resources

GGENTRtr code	GGENTRtr-85
Official Symbol	ABO
Vector	pENTR/D-TOPO
Fusion Site	aaa aaa gca ggc tcc gcg gcc gcc ccc ttc acc AGT CTA ATG CCA GGA AGC CTG GAA CGG GGG TTC TGC ATG GCT GTT AGG GA CAG CAG TGC AAC CCC GAT GGG CCG CTG GG
Contract	一般寄託 NBRC

This page does not indicate all of the enzymatic reaction, and expression of "A(ABO)".

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— ACGG-DB

GGdb

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— GlycoNAVI

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— ACGG-DB

LfDB

Lipids

GlyCosmos Database

GlyCosmos Glycolipids

Glycolipid entry from LIPID MAPS.

GlyCosmos Glycoproteins

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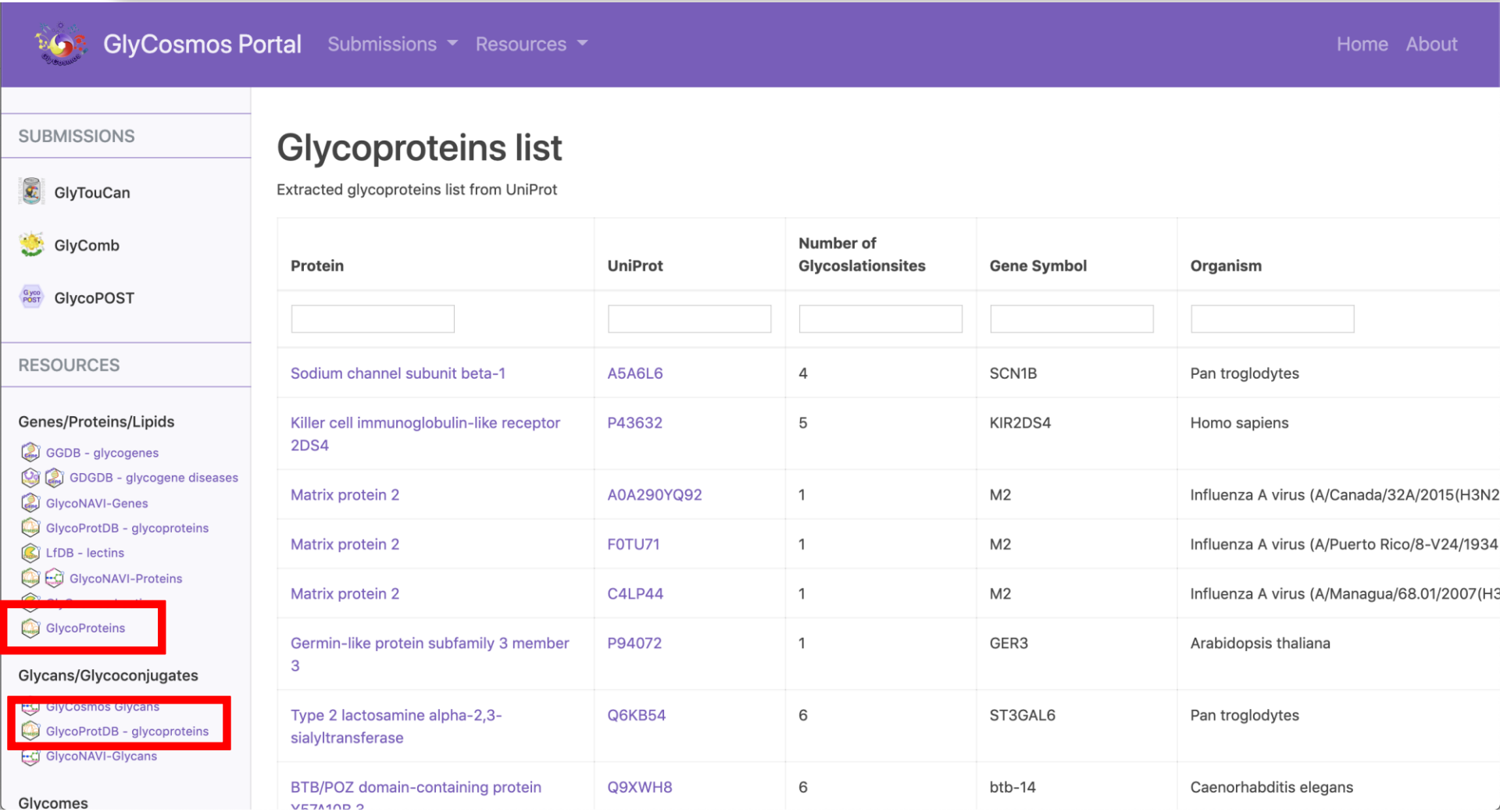
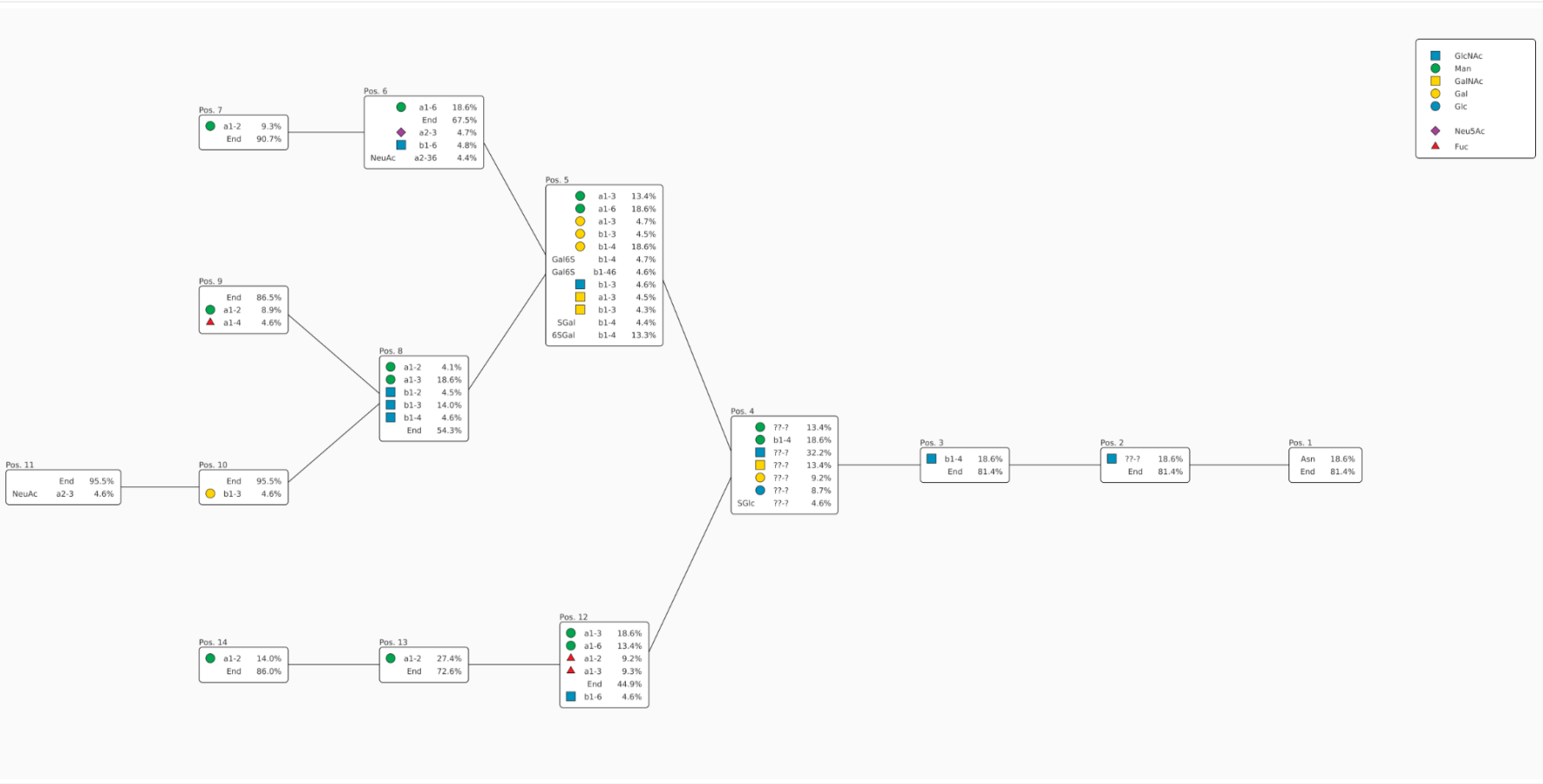


Glycoproteins list

Extracted glycoproteins list from UniProt

Protein	UniProt	Number of Glycoslationsites	Gene Symbol	Organism
Sodium channel subunit beta-1	A5A6L6	4	SCN1B	Pan troglodytes
Killer cell immunoglobulin-like receptor 2DS4	P43632	5	KIR2DS4	Homo sapiens
Matrix protein 2	A0A290YQ92	1	M2	Influenza A virus (A/Canada/32A/2015(H3N2
Matrix protein 2	F0TU71	1	M2	Influenza A virus (A/Puerto Rico/8-V24/1934
Matrix protein 2	C4LP44	1	M2	Influenza A virus (A/Managua/68.01/2007(H3
Germin-like protein subfamily 3 member 3	P94072	1	GER3	Arabidopsis thaliana
Type 2 lactosamine alpha-2,3-sialyltransferase	Q6KB54	6	ST3GAL6	Pan troglodytes
BTB/POZ domain-containing protein	Q9XWH8	6	btb-14	Caenorhabditis elegans



5090

Image from MCAW-DB

Human Protein Atlas

Tissue with high expression from Human Protein Atlas

- skin

GlyCosmos Portal

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Portal Submissions Resources Help

Glycomes

Glycome Database

Total Glycome Database

N-glycan, O-glycan, sphingolipids, glycosaminoglycans and free glycans as quantified from various types of cells.

Glycome Database

GlycomeAtlas

Visualization of glycome profiling data on human, mouse and zebrafish tissue samples.

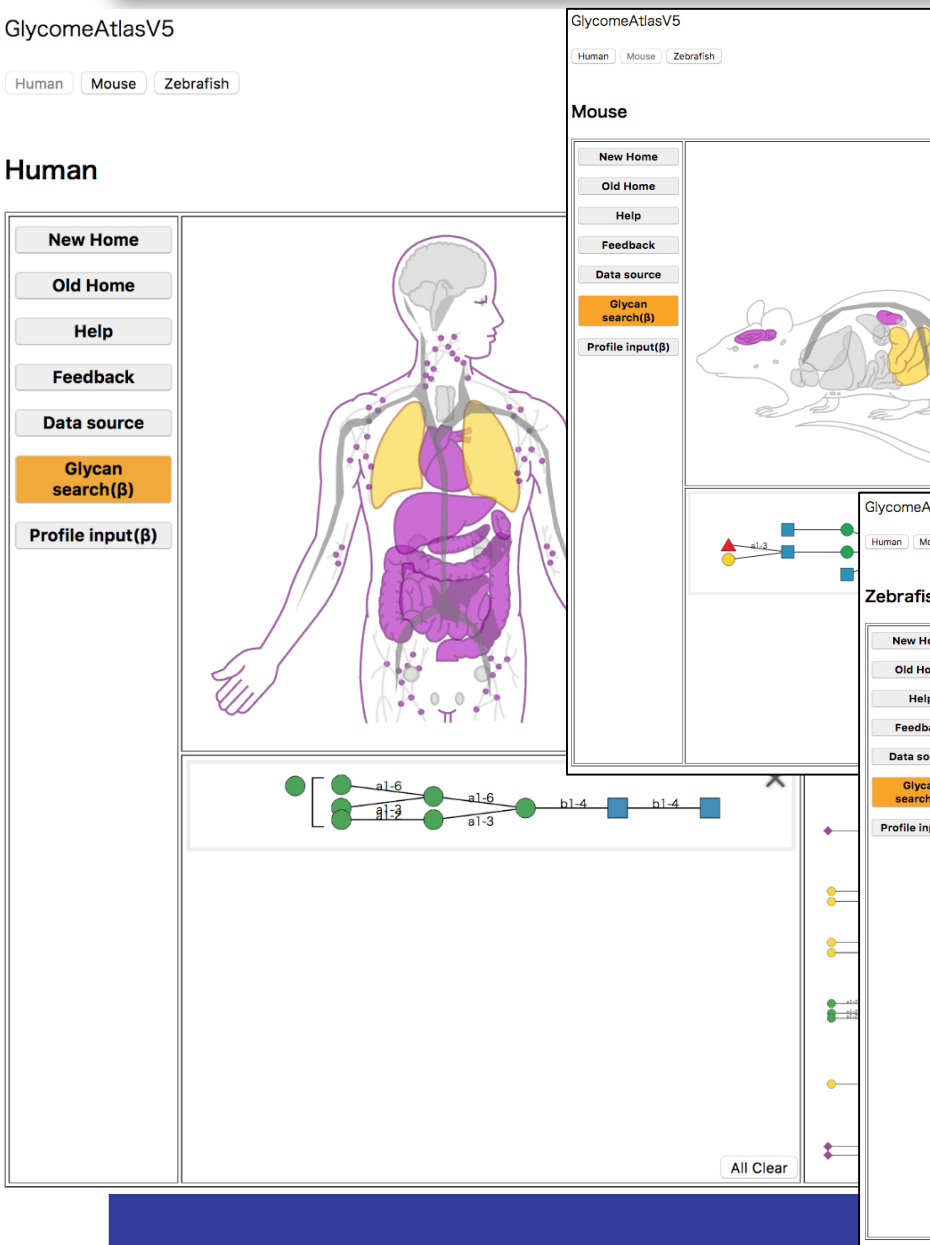
Glycome Database

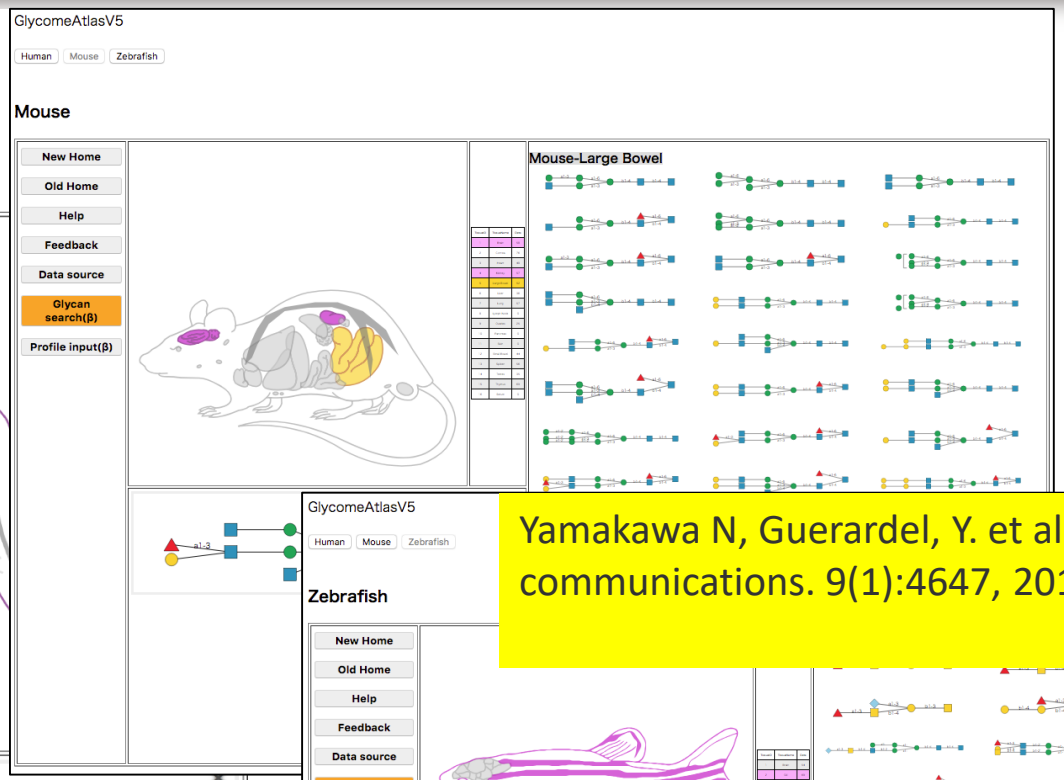
LM-GlycomeAtlas

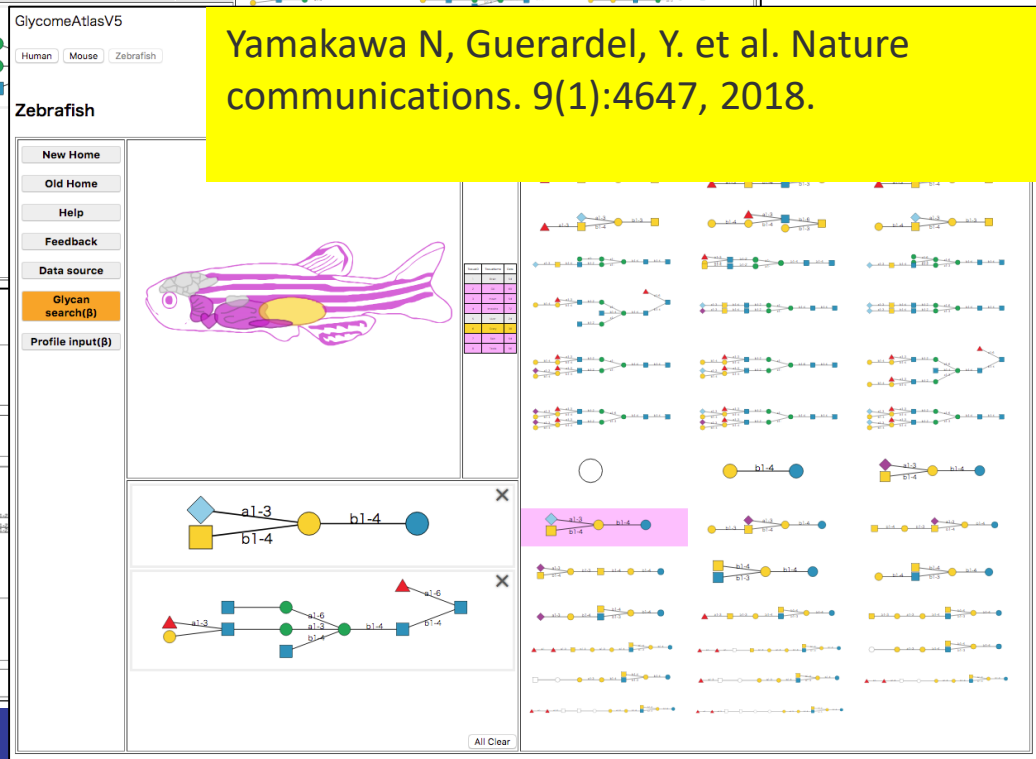
LM-GlycomeAtlas is a web tool visualizing the data from Lectin Array analyses by the Kuno Laboratory at AIST.

GlycomeAtlas

SOKA University



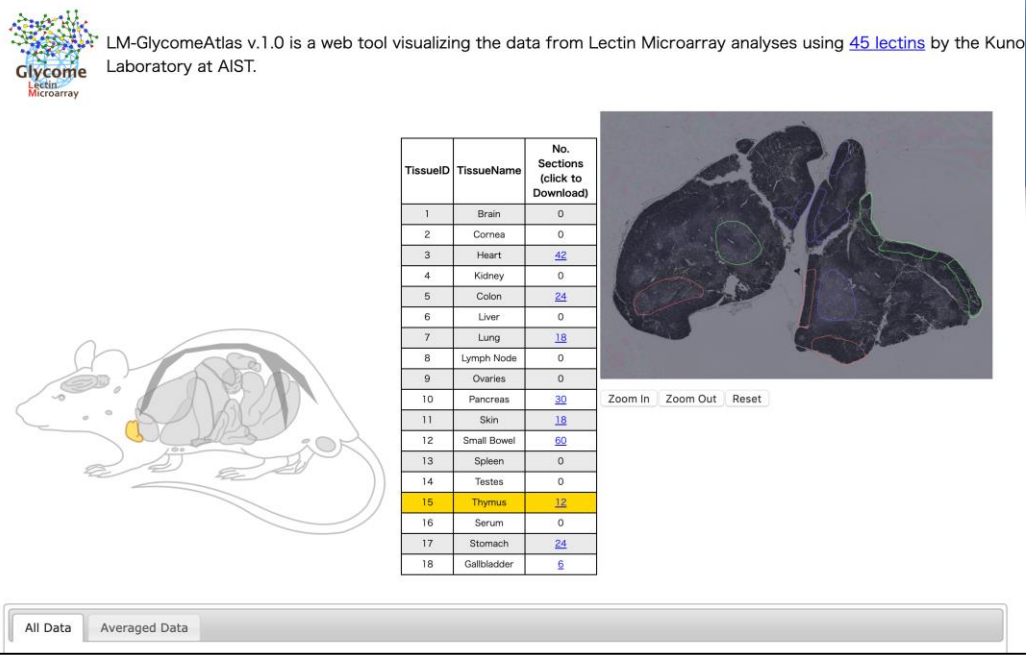




Yamakawa N, Guerardel, Y. et al. Nature communications. 9(1):4647, 2018.

LM-GlycomeAtlas

- Web tool to visualize laser microdissection-assisted lectin microarray analyses data using 45 lectins
  - high-throughput and in-depth glycomic profiling of formalin-fixed paraffin-embedded tissue sections



Molecules **2019**, *24*(16), 2962; **https://doi.org/10.3390/molecules24162962**

Open Access

Article

LM-GlycomeAtlas Ver. 1.0: A Novel Visualization Tool for Lectin Microarray-Based Glycomic Profiles of Mouse Tissue Sections

by Chiaki Nagai-Okatani [1,*], Kiyoko F Aoki-Kinoshita [2], Shuichi Kakuda [1], Misugi Nagai [1], Kozue Hagiwara [1], Katsue Kiyohara [1], Noriaki Fujita [1], Yoshinori Suzuki [1], Takashi Sato [1], Kiyohiko Angata [1] and Atsushi Kuno [1,*]

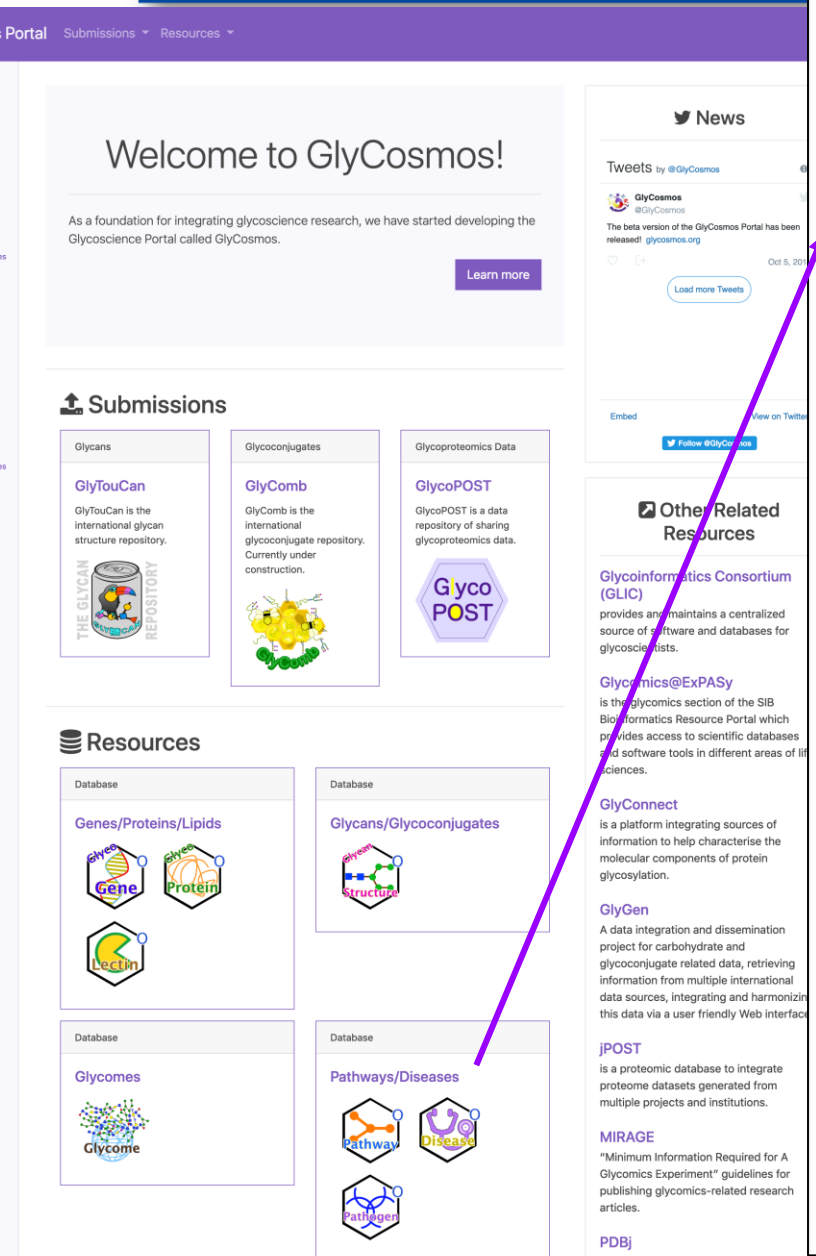
[1] Glycoscience and Glycotechnology Research Group, Biotechnology Research Institute for Drug Discovery, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Ibaraki 305-8568, Japan

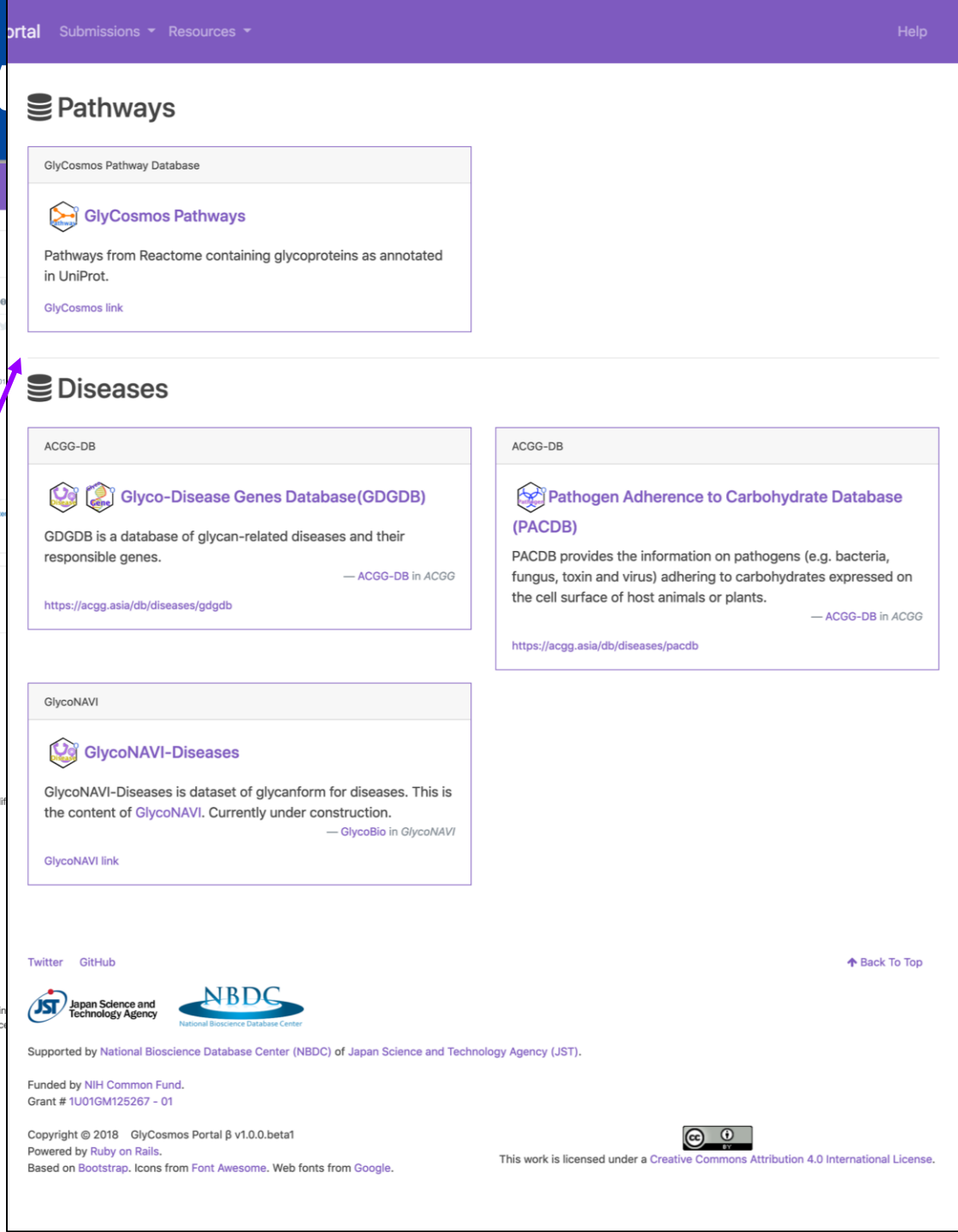
[2] Glycan & Life Science Integration Center (GaLSIC), Faculty of Science and Engineering, Soka University, Hachioji, Tokyo 192-8577, Japan

[*] Authors to whom correspondence should be addressed.

Received: 27 June 2019 / Accepted: 12 August 2019 / Published: 15 August 2019

GlyCosmos Port





GlyCosmos Pathways

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Pathway Names :

e.g. Metabolism

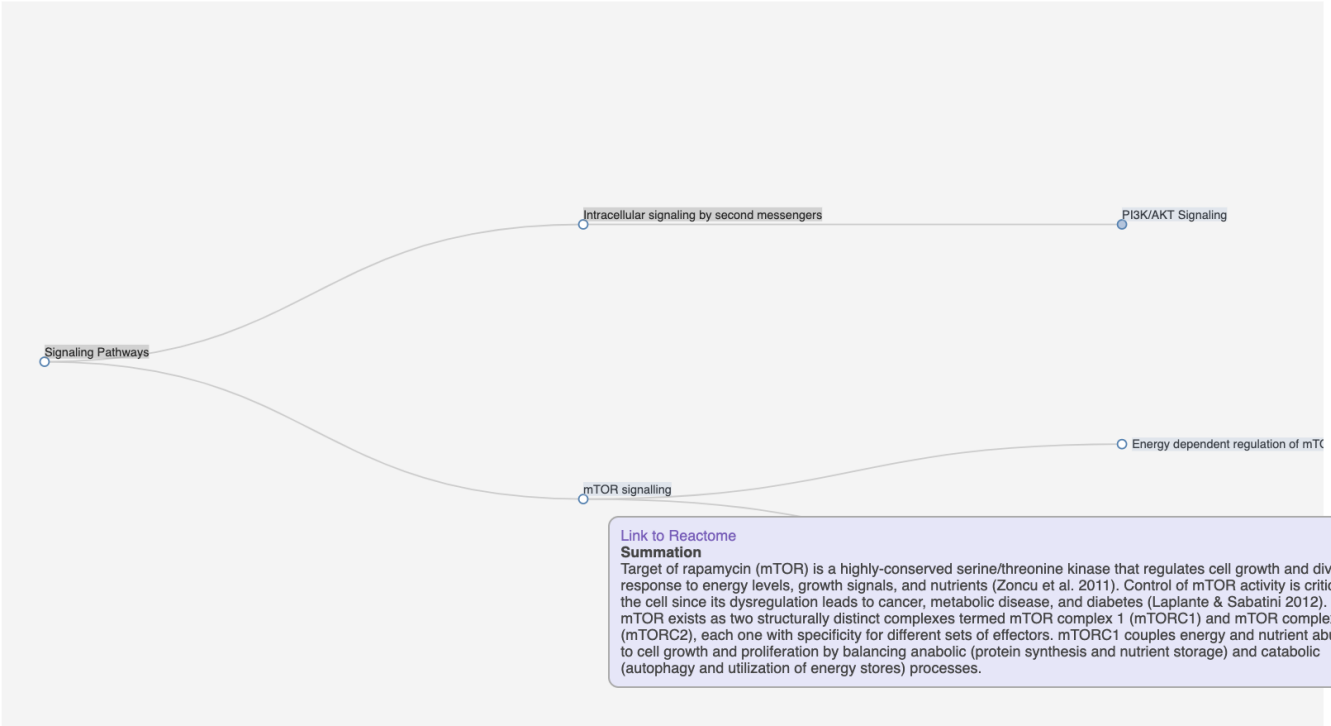
Click on a **Pathway Name** from the list below.
In the pathway map tree, click on circles to open/close subpathways, and click on pathways whose names are highlighted in light blue to view the detailed pathway map.

Keywords :

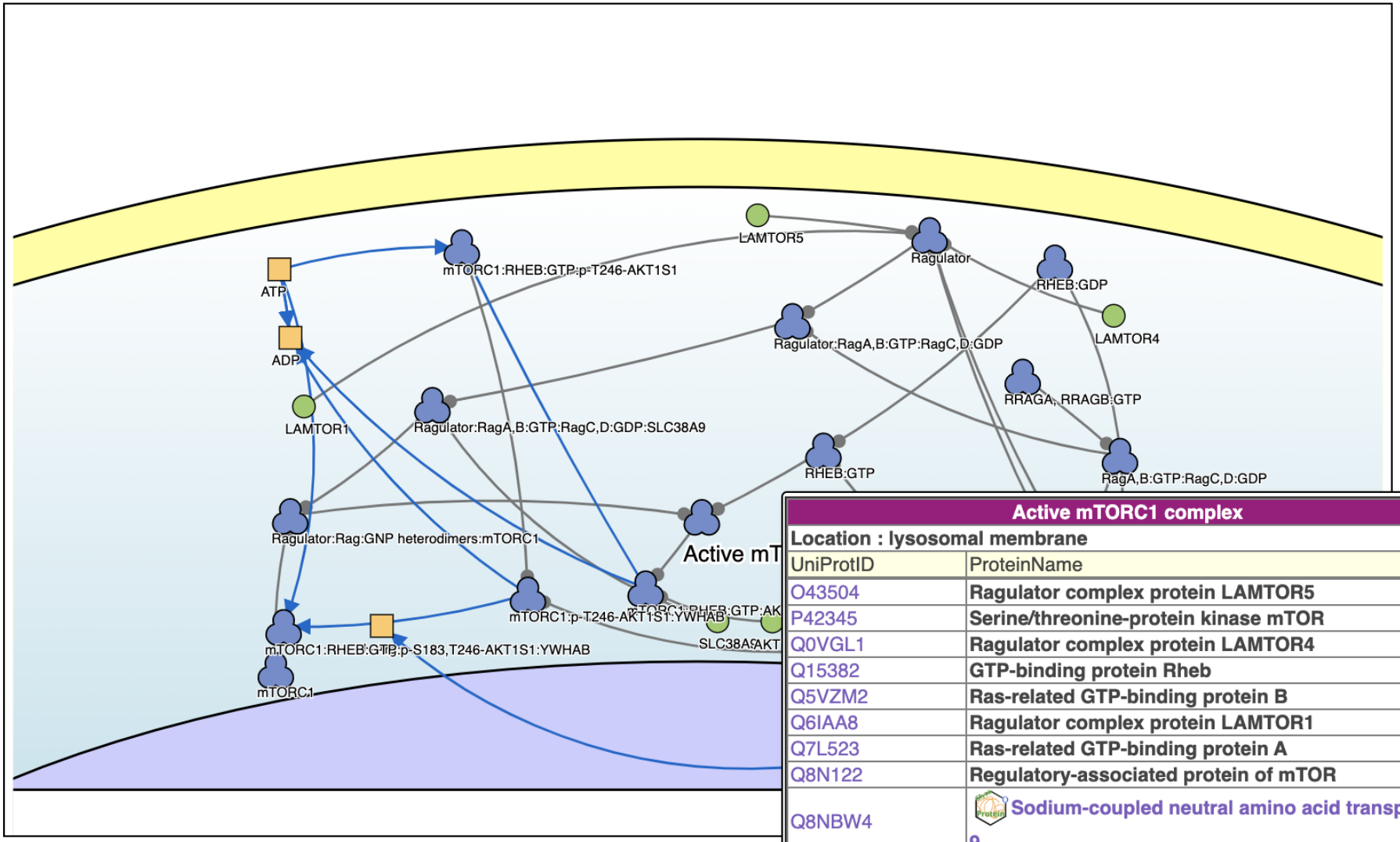
Homo sapiens | ragulator complex protein lamtor1

Event Hierarchy :

- Autophagy
- Cellular responses to external stimuli
- Gene expression (Transcription)
- Immune System
- Signaling Pathways



?pathway=mTOR signalling&species=48



Active mTORC1 complex	
Location : lysosomal membrane	
UniProtID	ProteinName
O43504	Ragulator complex protein LAMTOR5
P42345	Serine/threonine-protein kinase mTOR
Q0VGL1	Ragulator complex protein LAMTOR4
Q15382	GTP-binding protein Rheb
Q5VZM2	Ras-related GTP-binding protein B
Q6IAA8	Ragulator complex protein LAMTOR1
Q7L523	Ras-related GTP-binding protein A
Q8N122	Regulatory-associated protein of mTOR
Q8NBW4	Sodium-coupled neutral amino acid transporter 9
Q9BVC4	Target of rapamycin complex subunit LST8
Q9NQL2	Ras-related GTP-binding protein D
Q9UHA4	Ragulator complex protein LAMTOR3
Q9Y2Q5	Ragulator complex protein LAMTOR2

SPV: a JavaScript Signaling Pathway Visualizer, Bioinformatics, 2018

GlySpace Alliance

SOKA University

Established August, 2018 @ Warren Workshop

http://glyspace.org

GlySpace Alliance

SOKA University

目的: データの共有や連携についての合意を得ること

基本的な合意:

- データもソフトウェアも無料でオープンソースのライセンスで提供する
- 共通の標準を利用する（オントロジー、アクセッション番号など）
- 年1回の対面会議
  - 他のデータベースやソフトウェアのプロジェクトとの連携の議論など

現在の参加メンバー

- 糖鎖関連のマルチオミックス統合プロジェクト
- GlyConnect, GlyCosmos and GlyGen

Established August, 2018 @ Warren Workshop

Systems Glycobiology Consortium

SOKA University

JST MIRAI

Open Data

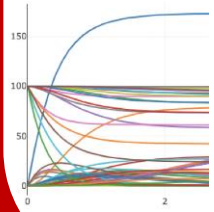
Dynamic aspects of Glycobiology

Systems Glycobiology Consortium

High-throughput (cloud) computing

Data and parameters

User Interfaces



Life Science Data

GlyCosmos

GLYSPACE ALLIANCE

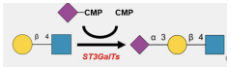
GlyGen

GLYCOMICS

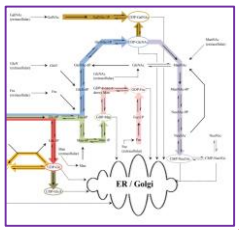
Glyco POST

THE GLYCAN REPOSITORY

Parameter estimation methods



Mathematical models



True understanding of glycan function and applications in medicine, agriculture, energy, etc.

目的:

システム糖鎖生物学研究のためのオープンプラットフォームの開発

- **データベース**
  - グライコミクス
  - トランスクリプトミクス
  - プロテオミクスなど
  - 反応パラメーター
  - パスウェイモデル
- **ソフトウェアモジュール**
  - オンラインでシミュレーションを実施するツール

まとめ

SOKA University

- GlyCosmos が糖鎖関連データの基盤を提供している
  - 4ヶ月おきのリリースを通して継続的にデータの更新を実施している
- GlySpace Allianceと共同に信頼できるデータを共有している
- 今後の発展として、ダイナミクスを含む糖鎖の機能解析を可能にする
- 日本糖質学会のオフィシャルポータルとして、コミュニティーからのコメント、提案、改良を歓迎

  support@glycosmos.org

Acknowledgements

Soka University

Masaaki Shiota
Masae Hosoda
Tamiko Ono
Shinichiro Tsuchiya
Akihiro Fujita
Haruko Kitakaze

AIST

Noriaki Fujita
Yoshinori Suzuki
Kiyohiko Angata
Hisashi Narimatsu
Atsushi Kuno
Chiaki Nagai-Okatani

Niigata University

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Yu Watanabe

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