

# Glycoscience Portal promoting interdisciplinary fusion



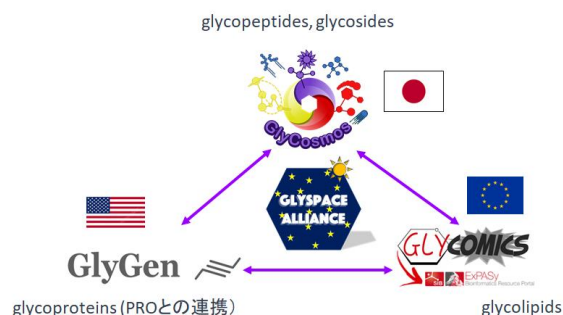
## GlyCosmos Glycoscience Portal

<https://glycosmos.org/>



Glycans are important molecules that bind to cell surfaces and secreted proteins, and are involved in many life phenomena such as cell recognition, immune responses, and development. Until now, no comprehensive, systematically organized database existed for glycans.

The GlyCosmos Glycoscience Portal (<https://glycosmos.org/>), under the international collaborative organization Glyspace Alliance, is an integrated portal that enables the search and viewing of glycan-related data, serving as an information infrastructure supporting glycan research by closely collaborating with major glycan databases in Europe and the United States. It consists of a repository for registering glycan structures and a database aggregating genes and pathways involved in glycans, glycan synthesis, and metabolism. It provides an easy-to-understand interface even for researchers who do not specialize in glycans, and serves as an information infrastructure for systems glycobiology linked with information on genomes, proteomes, and metabolomes.



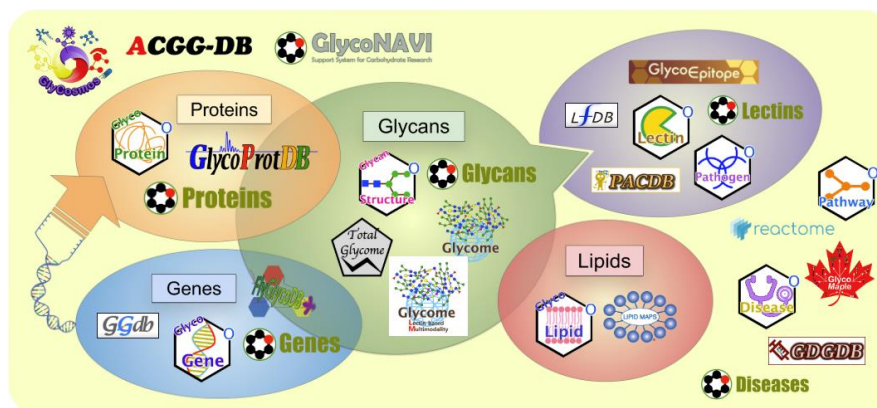
### Glyspace Alliance

#### Number of Data

##### Registered Data (as of August 2025)

Repository: 351,878 entries  
Glycan Structure: 252,649 entries  
Glycan Peptides: 99,229 entries

**GlyCosmos Database:** 865,172 entries  
Glycan-Related Genes: 423,164 entries  
Glycoproteins: 139,028 entries  
Lectins: 5,100 entries  
Glycolipids: 6,046 entries  
Glycans: 248,390 entries  
Pathways: 7,820 entries  
Related Diseases: 5,716 entries  
Biological Species: 29,908 entries



### GlyCosmos contains various glycan-related information.

#### • Average monthly access over the past four years

FY2021: Approximately 4,000, FY2022: Approximately 6,000, FY2023: Approximately 10,000, FY2024: Approximately 87,000

#### • Number of papers and number of citations (as of August 2025, surveyed by Scopus)

The number of related published papers is 19 (FY2016-FY2025), and the total number of citations for those papers is 593.

#### • Application Examples

University of Tsukuba used GlyCosmos to select 212 glycosyltransferases and glycosylation enzymes. They compared expression between wild-type and KRAS-mutant organoids and found that FUT6 and FUT3 expression was significantly increased in the KRAS-mutant group, suggesting potential therapeutic and biomarker roles (J. Oncology 2024).

GlyCosmos Glycoscience Portal is supported under JST Database Integration Coordination Program (DICP), "Data expansion and quality improvement of the Glycoscience Portal aiming towards interdisciplinary fusion (Principal Investigator: AOKI-KINOSHITA Kiyoko, Professor / Deputy Director, Faculty of Science and Engineering, Soka University)".

#### References

Yamada I *et al.*, The GlyCosmos Portal: a unified and comprehensive web resource for the glycosciences. Nat Methods. 2020 Jul;17(7):649-650. (DOI: 10.1038/s41592-020-0879-8).

# Data and functions included in GlyCosmos



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<https://glycosmos.org/>



### GlyCosmos Glycan-Related Data Repository (Number of data entries as of July 15, 2025)

Repository	Data	Number of data
GlyTouCan	International repository of glycan structures that assigns a unique ID to each glycan structure.	251,694 entries
GlyComb	Complex carbohydrate repository	Glycopeptides 99,229 entries Glycoproteins 26,953 entries
GlycoPOST	Repository of Glycan-Related Mass Spectrometry Data	entry 481 /public 331 projects
UniCarb-DR	Repository of Glycan Mass Spectrometry Spectra	2,764 structures / 4,670 spectrum
LM-GlycoRepo	Repository of mouse tissue lectin microarray data	entry 4 / public 4 projects

### Glycosmic resources integrated in GlyCosmos (Number of data entries as of July 15, 2025)

Resource	Data	Number of data
Genes	Glycotransferases such as KEGG, UniProt, and GlycoGene, hydrolytic enzymes of sugar bonds, and glycan-related metabolic genes	423,164 entities
Glycoproteins	UniProt glycoproteins (including glycosylation sites, glycans, diseases, 3D structure, pathway information, etc.)	139,028 entries
Lectins	UniProt's sugar-binding functional proteins (including information on glycosylation sites and glycan binding patterns)	5,100 entities
Glycolipids	Glycolipids in the LIPID MAPS Structural Database (LMSD)	6,046 entities
Glycans	GlyTouCan's verified glycan entries (updated weekly)	244,842 entities
Pathways	Reactom glycoproteins and glycans, E. coli O antigen and carbohydrate metabolic pathways in ECODAB	
Diseases	Glyco-Disease Genes Database and Alliance of Genome Resources Glyco-related gene disorders	4,115 entities
Organisms	Species included in GlyCosmos	29,908 entities

### Tools available in GlyCosmos

Tools	Function Description
SugarDrawer	A tool for plotting glycan structures and searching for GlyCosmos Glycans data.
Glycan Builder	A tool for plotting glycan structures and searching data within GlyCosmos.
Glycan Converters	A tool for conversion of glycan structures between WURCS, GlycoCT, and IUPAC
GlycoMaple	A tool for visualizing glycosylation pathways from human and mouse glycosylation gene expression data.
GlycomeAtlas	Atlas of the glycan structure and distribution information of various cells in humans, mice, and zebrafish.
LM-GlycomeAtlas	A web tool for visualizing lectin microarray data (developed with support from AMED).
GALAXY	Database of elution data for glycoprotein sugar chain structures analyzed by HPLC
MCAW	A tool for multiple alignment of glycan structures. It can find common structures between multiple glycan structures.
GlycoSim	A tool for simulating glycosylation
GRable	Software that uses Glyco-RIDGE to estimate the site-specific glycan composition of glycopeptides.