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
Knowledge-Sharing of Glycan Knowledge via Internet

1. Structure Registration
2. Obtain Unique Glycan ID
3. Manuscript submission
4. Curation

Glycan Databases

International Glycan Structure Data Repository

Unique Glycan ID + Structure Data

Sharing

Research Paper

Glycan ID

Glycan ID

Annotation Data

Glycan Research
New GlyTouCan 3.0 (August, 2019)

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

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

User Profile Page:
- Validation results
- Images
- Assigned ID
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.

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

<table>
<thead>
<tr>
<th>ID</th>
<th>Project title</th>
<th>Description</th>
<th>Publication</th>
<th>Principal investigator</th>
<th>Announcement date</th>
<th>Detail</th>
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</thead>
<tbody>
<tr>
<td>GPST000038</td>
<td>UniCarb-DR</td>
<td>Data from UniCarb-DR</td>
<td>31332201</td>
<td>Niclas G. Karlsson</td>
<td>2019/10/02</td>
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<tr>
<td>GPST000027</td>
<td>GnT3 KO mouse brain</td>
<td>Bisecting GlcNAc is a general suppressor of terminal modification of N-glycan</td>
<td>31375533</td>
<td>Miyako Nakano</td>
<td>2019/09/21</td>
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<td>GPST000031</td>
<td>GnT3 KO mouse kidney</td>
<td>Bisecting GlcNAc is a general suppressor of terminal modification of N-glycan</td>
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<td>Miyako Nakano</td>
<td>2019/09/21</td>
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<td>GPST000030</td>
<td>Reference glycan structure libraries of primary human cardiomyocytes and pluripotent stem cell-derived cardiomyocytes reveal cell-type and culture stage-specific glycan phenotypes</td>
<td>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...</td>
<td></td>
<td>Rebekah L. Gundry</td>
<td>2019/08/31</td>
<td></td>
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<td>GPST000029</td>
<td>Standardization of PGC-LC-MS-based glycomics for sample specific glycotyping</td>
<td>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...</td>
<td>31065629</td>
<td>Nicolle H Packer</td>
<td>2019/06/28</td>
<td></td>
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<td>GPST000024</td>
<td>Discrimination of Isomers of Released N- and O-Glycans Using Diagnostic Product Ions in Negative Ion PGC-LC-ESI-MS/MS</td>
<td>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...</td>
<td>29603058</td>
<td>Nicolle H. Packer</td>
<td>2019/06/28</td>
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<td>GPST000009</td>
<td>Atlantic Salmon mucus from skin, pyloric caeca and distal intestine</td>
<td>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...</td>
<td>30923042</td>
<td>Sara Lindén</td>
<td>2019/04/10</td>
<td></td>
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</tbody>
</table>
Submissions:
• GlyTouCan
• GlyComb
  (under development)
• GlycoPOST

Resources:
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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.

GlycoNAVI-Genes

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

LIPID MAPS Gene/Proteome Database (LMPD)

LIPID MAPS Gene/Proteome Database (LMPD)

Lipid-related genes and proteins entry from LIPID MAPS.
### Expression


**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


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

Oriel R. et al. PMID: 2433836


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

Clausen H. et al. PMID: 2464874


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

Hakomori S. PMID: 6782678

### Biological Resources

<table>
<thead>
<tr>
<th>GGENTRtr code</th>
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<tbody>
<tr>
<td>Official Symbol</td>
<td>ABO</td>
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<tr>
<td>Vector</td>
<td>pENTR/D-TOPO</td>
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<tr>
<td>Fusion Site</td>
<td>aaa aca gcc ggc tcc gge gcc ggc ccc tcc acc AGT CTA ATG CCA GGA AGC CTG GAA CGG GGG TTC TGC ATG</td>
</tr>
<tr>
<td>Contract</td>
<td>一般寄託 NBRC</td>
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</table>
GlyCosmos Portal

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LIPID MAPS Gene/Proteome Database (LMPD)
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Lipid-related genes and proteins entry from LIPID MAPS.

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

ACPDB
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.

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.
### Glycoproteins list

Extracted glycoproteins list from UniProt

<table>
<thead>
<tr>
<th>Protein</th>
<th>UniProt</th>
<th>Number of Glycoslation sites</th>
<th>Gene Symbol</th>
<th>Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium channel subunit beta-1</td>
<td>A5A6L6</td>
<td>4</td>
<td>SCN1B</td>
<td>Pan troglodytes</td>
</tr>
<tr>
<td>Killer cell immunoglobulin-like receptor 2DS4</td>
<td>P43632</td>
<td>5</td>
<td>KIR2DS4</td>
<td>Homo sapiens</td>
</tr>
<tr>
<td>Matrix protein 2</td>
<td>A0A290YQ82</td>
<td>1</td>
<td>M2</td>
<td>Influenza A virus (A/Canada/32A/2015(H3N2))</td>
</tr>
<tr>
<td>Matrix protein 2</td>
<td>F0TU71</td>
<td>1</td>
<td>M2</td>
<td>Influenza A virus (A/Puerto Rico/8-V24/1934)</td>
</tr>
<tr>
<td>Matrix protein 2</td>
<td>C4LP44</td>
<td>1</td>
<td>M2</td>
<td>Influenza A virus (A/Managua/68.01/2007(H5N1))</td>
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<tr>
<td>Germin-like protein subfamily 3 member 3</td>
<td>P94072</td>
<td>1</td>
<td>GER3</td>
<td>Arabidopsis thaliana</td>
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<tr>
<td>Type 2 lactosamine alpha-2,3-sialyltransferase</td>
<td>Q6KB54</td>
<td>6</td>
<td>ST3GAL6</td>
<td>Pan troglodytes</td>
</tr>
<tr>
<td>BTB/POZ domain-containing protein KEMO3</td>
<td>Q9XWH8</td>
<td>6</td>
<td>btb-14</td>
<td>Caenorhabditis elegans</td>
</tr>
</tbody>
</table>
**Glycome Database**

**Total Glycome Database**

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

**Glycome Database**

**LM-GlycomeAtlas**

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

**Glycome Database**

**GlycomeAtlas**

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

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,*

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* Authors to whom correspondence should be addressed.

Received: 27 June 2019 / Accepted: 12 August 2019 / Published: 15 August 2019
**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 regulator complex protein lamtor1

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

**Link to Reactome**
**Summation**
Target of rapamycin (mTOR) is a highly-conserved serine/threonine kinase that regulates cell growth and division in response to energy levels, growth signals, and nutrients (Zoncu et al. 2011). Control of mTOR activity is critical for the cell since its dysregulation leads to cancer, metabolic disease, and diabetes (Laplante & Sabatini 2012). In cells, mTOR exists as two structurally distinct complexes termed mTOR complex 1 (mTORC1) and mTOR complex 2 (mTORC2), each one with specificity for different sets of effectors. mTORC1 couples energy and nutrient abundance to cell growth and proliferation by balancing anabolic (protein synthesis and nutrient storage) and catabolic (autophagy and utilization of energy stores) processes.
GlySpace Alliance

Established August, 2018 @ Warren Workshop

http://glyspace.org
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、アクセスション番号など）
• 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
Dynamic aspects of Glycobiology

Life Science Data

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

Parameter estimation methods

Mathematical models

Open Data

Systems Glycobiology Consortium

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

• 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
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GlyTouCan Users

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