Glycobiology Solutions for Your Research and Development Needs
An Esoteric Discipline?

Glycans are nearly ubiquitous in eukaryotes and are essential for many cellular activities. However, for non-specialists, glycobiology has the reputation of being an esoteric discipline. It is among the least understood biological disciplines for several reasons including conceptual complexity and the lack of useful reagents.

Our Mission

Bio-Techne scientists have advanced the Glycobiology field with many peer-reviewed scientific publications. The outcome of our research and development enterprise is a broad array of solutions for your glycobiology research and development needs. Our mission is to provide useful solutions that will increase the accessibility of glycobiology research to specialists and non-specialists alike.

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What is Glycobiology

Glycobiology is defined as “the study of the structure, biosynthesis, biology, and evolution of saccharides (also called carbohydrates, sugar chains or glycans) that are widely distributed in nature and of the proteins that recognize them” (1).

What is Glycosylation?

Glycosylation is a dynamic post-translational modification that produces structural differences that fine tune the functions of proteins, lipids and other glycans. Glycans are some of the most structurally varied molecules in nature. This extensive diversity is due to both the large number of existing mono-saccharides and the different glycosidic linkages that can form between individual monosaccharide units. Unlike proteins and nucleic acids, glycan synthesis is not template based. Instead, glycosylation is primarily determined by the availability of specific substrates and the presence of enzymes that regulate the addition and removal of glycan moieties. The increasing availability of research reagents, including tools for glycan visualization as well as regulatory enzymes such as glycosyltransferases, glycosidases, sulfotransferases and sulfatases offers a unique opportunity to advance the field of glycobiology.

Why is Glycosylation Important?

1. Glycans play a role in communication between cells and their external environment.
2. Glycosylation is important for protein folding and quality control.
3. Glycans play an important role in the development of multicellular organisms.
4. Glycosylation is an important determinant of the efficacy of biologics such as therapeutic antibodies.

How Can We Help You?

I want to quickly assess the glycosylation of my antibody or biologic
Our Simple Western and iCE platforms help you quickly screen biologics prior to initiating a more involved assessment. See Page 4

I want to visualize terminal glycans on cells or proteins
We offer the most specific technology on the market for visualizing terminal glycans on cells and proteins. See Page 5

I want to know which glycoprotein or proteoglycan is expressed in my cell or tissue
We offer the largest selection of glycoprotein and proteoglycan antibodies or RNA in situ hybridization probes available. See Pages 5 and 6

I want to alter the glycosylation of my target of interest
We also have the broadest selection of glycoenzymes. See page 6

I want to assess the enzymatic activity of my glycoenzyme
We have kits to assay glycosyltransferase, sialyltransferase and sulfotransferase enzymatic activity. See Page 7

I want to selectively target glycoproteins
We offer small molecules and peptides for targeting glycoproteins. See Page 7.

I want help with my custom glycan project
Start a conversation with our custom services department. See page 7


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Quickly Screen Your Antibody or Biologic Using the Simple Western™ Platform

Our Simple Western capillary electrophoresis platform performs automated glycan analysis using workflows that are simple and straightforward. Use these assays as a quick screening method to prior to initiating more traditional and labor-intensive methods for glycan analysis. This assay uses glycan binding proteins (Lectins) in a manner similar to antibodies to probe for glycans. Don’t want to make a capital purchase? Contact us for custom target validation and optimization services using the Simple Western platform.

Use Peggy Sue for charge-based lectin blots. Charge based capillary electrophoresis was used to assess the glycosylation of the reference monoclonal antibody (mAb), NIST RM8671. A large peak, representing the binding of the lectin Concanavalin A (Con A) to the glycan Mannose was absent when NIST was deglycosylated.

Use Jess or Wes for size-based lectin blots. Glycosylation of the NIST mAb heavy chain was visualized via size based capillary electrophoresis using the glycan binding proteins Con A and Wheat Germ Agglutinin (WGA). No glycosylation was observed in samples that were deglycosylated using PNGase F.

Use the iCE Platform as Part of Your mAb Fragmentation Analysis Workflow

Monoclonal antibody fragmentation is an important quality control step in the manufacturing of mAbs. During this process, nonglycosylated heavy chain (NGHC), heavy chain (HC) and light chain (LC) are resolved in order to assess mAb lot-to-lot consistency. Maurice automates capillary electrophoreses to expedite this step in the manufacturing process. Maurice consistently resolves NGHC from HC with more sensitivity than traditional SDS-PAGE chip-based electrophoretic separation systems.

Use Maurice for mAb fragmentation Analysis. Under reduced sample conditions, the dominant light chain (LC) and HC peaks plus the major LC impurities or spikes (rhTRIP-4, spike 1; reMAP, spike 2) are detected by both Maurice (left) and LabChip® (right), but notably better resolution between the LC peak and two spikes were observed with Maurice. On Maurice, the LOD was 1.5 µg/mL and 1.9 µg/mL for Spike 1 and Spike 2, respectively, whereas the LOQ was 11.5 µg/mL (Spike 1) and 9.6 µg/mL (Spike 2). Using LabChip®, the LOD and LOQ could only be determined for Spike 1 (0.5 µg/mL and 1.7 µg/mL, respectively) due to poor resolution between Spike 2 and the LC peak.

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Visualize Terminal Glycans Using Fluorescence or SDS-PAGE

Selective and specific labeling of terminal glycans has historically been a challenge due to the lack of high-affinity reagents. Our technology takes advantage of the selective action of glycosyltransferases on substrate glycans to provide the most specific glycan visualization assay on the market. Our Terminal Glycan Assay allows you to visualize glycan subcellular localization as well as protein glycosylation using standard fluorescence or SDS-PAGE technologies.

The glycoenzyme Human B3GALNT2 or the mutant enzyme, B4GalT1Y285L, can transfer GalNac to O-GlcNAc residues. UDP-Azido GalNAc is the donor substrate in this reaction. In this example, azido-GalNAc is installed on the acceptor GlcNAc at position β1-4 in HUVEC cells. This reaction was visualized using Alexa-Fluor 555. Fluorescence was observed in the nucleus, DAPI was used to stain nuclei. Terminal O-GlcNAc is localized to the nucleus and cytoplasm in HUVEC cells under these conditions, as visualized by azido-GalNAc fluorescence.

The top gel shows total protein staining. Bovine Fetuin (left side) and desialated fetuin (right side) were incubated with increasing amounts of recombinant enzyme Human ST3GAL1 (5, 25, 50, 250 ng) and 0.5 nmol of the donor substrate CMP-Azido-Sialic Acid. The reactions were conjugated with Biotinylated Alkyne, separated by SDS Page, transferred to nitrocellulose and detected with Streptavidin-HRP via chemiluminescence. Incorporation of Azido Sialic Acid is only detected on desialated fetuin (right side of bottom gel) indicating that ST3GAL1 sialylates fetuin only after is desialylated.

Spatially Map Glycoprotein and Proteoglycan Biomarker Expression with RNAscope® In Situ Hybridization Assays

Glycoproteins and proteoglycans are commonly identified as biomarkers in the context of cancer and other diseases. Our ready to use RNAscope® assays, based on the proprietary RNAscope® in situ hybridization (ISH) technology, allow you to visualize the expression of any target glycoprotein or proteoglycan of interest morphologically within the tissue context. These assays provide options for chromogenic or fluorescent detection and allow you to simultaneously interrogate up to 2 or 3 targets, respectively. Our RNAscope® ISH assays can also be used with the automated tissue stainers Leica BOND RX System by Leica Biosystems and Ventana DISCOVERY ULTRA system by Roche Tissue Diagnostics.

Mucin 1 (MUC1) is an o-glycosylated oncoprotein that has been correlated with cancer progression. Here the RNAscope® assay was used to visualize MUC1 gene expression in human breast cancer tissue.

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Use Glycoenzymes to Understand Glycan Structure and Function

Oligosaccharide or glycan tree structure is a critical determinant of glycan function. Since the structure is determined by enzymatic activity, glycoenzymes represent a unique tool for gaining insight into glycan function. We have over 40 years of experience in developing high-quality enzymes and we provide the largest selection (4X the competition!) of highly-purified, active mammalian and bacterial recombinant glycoenzymes!

- Carbohydrate Kinases
- Carbohydrate Sulfotransferases
- Fucosidases
- Fucosyltransferases
- Galactosidase
- Galactosyl Transferases
- GaINAc Transferases
- GlcNAc Transferases
- Glucosidases
- Glucosyltransferases
- Glucuronosyltransferases
- Glycosidases
- Hexosaminidases
- Neuraminidases
- Pentosyltransferases
- Protein Sulfotransferases
- Sialyltransferases
- Sulfatases

Glycosyltransferases catalyze the transfer of a monosaccharide moiety from a nucleotide sugar or lipid phosphosugar to acceptors such as glycans, proteins or lipids. Glycosidases hydrolyze glycosidic linkages to release monosaccharides or oligosaccharides.

Sulfotransferases catalyze the transfer of a sulfate group to a hydroxyl or amine moiety on various molecules, including carbohydrates and proteins. In contrast, sulfatases catalyze the hydrolysis of O- and N-sulfate esters from these molecules.

Detect Glycoproteins and Proteoglycans Using our Validated Antibodies

We offer over 2,000 glycoprotein and proteoglycan antibodies. Count on our highly-validated antibodies for reproducible results. Our antibodies fit into your workflow and give you the right answers the first time and every time.

Klotho was detected in perfusion fixed frozen sections of mouse kidney using 1.7 µg/mL Goat Anti-Mouse Klotho Antigen Affinity-purified Polyclonal Antibody overnight at 4 °C. Tissue was stained with the Anti-Goat HRP-DAB Cell & Tissue Staining Kit and counterstained with hematoxylin (blue).
Measure Glycoenzyme Activity with Our Glycobiology Assay Kits

Assaying glycosyltransferase activity can be challenging. Historically these assays have involved the use of radiolabeled glycans. We offer inexpensive, non-radioactive assays for analyzing the activity of glycoenzymes including glycosyltransferases, sialyltransferases, and sulfotransferases. Use this 96-well plate assay to measure glycoenzyme kinetics.

High Quality Small Molecules and Peptides for Glycobiology Research

Small molecules and peptides are the among the most effective tools for understanding mechanism of action. As your trusted supplier of innovative and high-performance life science reagents, we offer a selection of glycoprotein inhibitors and activators, including those for integrins. We are committed to providing compounds with extremely high purity.

ATN 161 is a α5β1 integrin receptor antagonist, which reduces MLL tumor growth in rats and decreases tumor volume of human MDA-MB-231 cell xenografts in mice.

Contact Custom Services for Bulk or Custom Analytic Solutions

Bio-Techne is pleased to partner with you for custom and bulk requests. Contact us for custom glycan analytic testing services. We also offer a broad range of custom solutions including:

- Antibody Services and Panels
- Bioactivity Testing Services
- Biomarker Testing Services
- Chemistry services
- Custom Cell Culture Services
- Custom cDNA Cloning
- Custom Compound Libraries
- ELISA Services
- Luminex Services
- Protein Services

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Bio-Techne and its family of world class brands are a trusted member of the glycobiology community. We are committed to glycobiology research and development by assuring the quality of our scientific publications, products, instruments and services.

- **1000 Glycoprotein Antibodies**
- **400 Proteoglycan Antibodies**
- **200 Control Lysates**
- **20 Integrin Inhibitors**
  - Ac-Pro-His-Ser-Cys-Asn-NH₂
- **30 Years of Experience**
- **>300 Glycobiology Probes and Controls**

**R&D Systems**
- **Selective Technology**
- **40 Years of Experience**
- **>35 Glycosyltransferases**

**ProteinSimple**
- **New Probes Designed in 2 Weeks**
- **<1 Day Workflows and Time to Result**
- **3 Orders of Magnitude**
  - Dynamic Range for Simple Western

**Novus Biologicals**
- **Single-Copy RNA Detection**
- **>200 Control Lysates**
- **>200 Proteoglycan Antibodies**
- **>1000 Glycoprotein Antibodies**

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