Gold Standard in Glycan Profiling

GlycoStation™ Reader 1200

GlycoLite™ 2100

LecChip™
Technology Platform: GlycoStation™

Lectin Microarray: LecChip™
Glycan is a face of cell:
Life doesn’t exist without glycans

Glycoprotein Cell Receptors
Surface carbohydrates on cells serve as points of attachment for other cells, infectious bacteria, viruses, toxins, hormones and many other molecules.

Membrane Proteins are heavily glycosylated

P.M.Rudd et al., J. Mol. Biol. 293, 351-366
Why Glycan is so Important?

- More than 50% of proteins expressed in *human* are glycosilated.
- Glycan structure changes drastically in the process of life generation, differentiation, and also with initiation of cancer.
- Each one of tissues has different glycan structure, and also it is specific to species.
- Some glycan structures are different individually (for instance, A, B, and O blood type).
- So, most phenomenon involved in medical treatments are related to structural change of glycan structures.

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Cancer

More than 70% of tumor markers are carbohydrate antigens.

Immunity

Most differentiation antigens are glycoproteins.

Infectious Disease

Most targets of infection are carbohydrate antigens.

Regenerative Medicine

80% of stem cell markers are carbohydrate antigens.
An example of Differential Profiling of Crude Samples: Organs taken from Rat

The difference can be seen clearly in the following structures:
- Siaα2-6
- T-antigen
The **GlycoStation™** system is a multi-component research instrument designed to measure the profiling patterns of fluorescent signals generated from labeled target glycopeptides and/or glycoproteins hybridized to lectin spotted glass microarrays ("**LecChip™**").

The resulting fluorescence patterns are analyzed differentially with the **GlycoStation™ Tools Pro**.

**LecChip™ Ver.1.0**

45 different natural lectins

Direct scan without any washing and dry-out processes

Scanned fluorescence image
LecChip™: World top class quality as a protein chip

Good control of the shape of each spot and the CV-value

Configuration

Number of Lectins: 45 species, 3 spots per lectin
Number of Wells: 7 wells on a slide glass, well volume=100μL
CV value: <20% (overall)
Storage Life: Approx. 180 days
Storage Condition: -20°C
Interaction between glycan and lectin is so weak

Glycan/Lectin: $K_d \sim 10^{-4} \sim 10^{-7}$ M

Antigen/Antibody: $10^{-6} \sim 10^{-9}$ M

Avidin/Biotin: $10^{-12}$ M
Easy to use and High Sensitive

\[ d = \frac{\lambda}{2\pi \left(\frac{n_1^2}{\sin^2 \theta} - n_2^2\right)^{1/2}} \]

where \( d \) = evanescent field depth (intensity becomes 1/e)

\( \lambda \) = wavelength

\( n_1 \) = refractive index of slide glass (1.52)

\( n_2 \) = refractive index of water (1.33)

d = 156 nm (when \( \lambda = 670 \) nm)

4-6 nm

3-4 nm

Excitation light

Labeled Glycoproteins

Evanescent field depth = \( \approx 150 \) nm

Fluorescence

Lectin1, Lectin2, Lectin3, Lectin4, Lectin5, Lectin6, Lectin7

Slide Glass
<table>
<thead>
<tr>
<th>Lectin No.</th>
<th>Lectin</th>
<th>Reported specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LTL</td>
<td>Fuca1-3(Galβ1-4)GlcNAc, Fuca1-2Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>2</td>
<td>PSA</td>
<td>Fuca1-6GlcNAc, α-D-Glc, α-D-Man</td>
</tr>
<tr>
<td>3</td>
<td>LCA</td>
<td>Fuca1-6GlcNAc, α-D-Glc, α-D-Man</td>
</tr>
<tr>
<td>4</td>
<td>UEA-I</td>
<td>Fuca1-2Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>5</td>
<td>AOL</td>
<td>Fuca1-6GlcNAc (core fucose)</td>
</tr>
<tr>
<td>6</td>
<td>AAL</td>
<td>Fuca1-6GlcNAc, Fuca1-3(Galβ1-4)GlcNAc</td>
</tr>
<tr>
<td>7</td>
<td>MAL</td>
<td>Sias2-3Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>8</td>
<td>SNA</td>
<td>Sias2-6Gal/GalNAc</td>
</tr>
<tr>
<td>9</td>
<td>SSA</td>
<td>Sias2-6Gal/GalNAc</td>
</tr>
<tr>
<td>10</td>
<td>TJA-I</td>
<td>Sias2-6Gal/GalNAc</td>
</tr>
<tr>
<td>11</td>
<td>PHAL</td>
<td>tri/tetra-antennary complex-type N-glycan</td>
</tr>
<tr>
<td>12</td>
<td>ECA</td>
<td>Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>13</td>
<td>RCA120</td>
<td>Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>14</td>
<td>PHAE</td>
<td>bi-antennary complex-type N-glycan with outer Gal and bisecting GlcNAc</td>
</tr>
<tr>
<td>15</td>
<td>DSA</td>
<td>(GlcNAcβ1-4)n, Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>16</td>
<td>GSL-II</td>
<td>agalactosylated tri/tetra antennary glycans, GlcNAc</td>
</tr>
<tr>
<td>17</td>
<td>NPA</td>
<td>High-Mannose, Manα1-6Man</td>
</tr>
<tr>
<td>18</td>
<td>ConA</td>
<td>High-Mannose, Manα1-6(Manα1-3)Man</td>
</tr>
<tr>
<td>19</td>
<td>GNA</td>
<td>High-Mannose, Manα1-3Man</td>
</tr>
<tr>
<td>20</td>
<td>HHL</td>
<td>High-Mannose, Manα1-3Man, Manα1-6Man</td>
</tr>
<tr>
<td>21</td>
<td>ACG</td>
<td>Sias2-3Galβ1-4GlcNAc</td>
</tr>
<tr>
<td>22</td>
<td>TlXCI</td>
<td>Manα1-3(Manα1-6)Man, bi- and tri-antennary complex-type N-glycan, GalNAc</td>
</tr>
<tr>
<td>23</td>
<td>BFL</td>
<td>Galβ1-3GalNAc, GalNAc</td>
</tr>
<tr>
<td>24</td>
<td>TJA-II</td>
<td>Fuca1-2Galβ1-4 or GalNAcβ1-4 groups at their nonreducing terminals</td>
</tr>
<tr>
<td>25</td>
<td>EEL</td>
<td>blood group B antigen, Galα1-3Gal</td>
</tr>
<tr>
<td>26</td>
<td>ABA</td>
<td>Galβ1-3GalNAc</td>
</tr>
<tr>
<td>27</td>
<td>LEL</td>
<td>GlcNAc trimers/tetramers</td>
</tr>
<tr>
<td>28</td>
<td>STL</td>
<td>GlcNAc oligomers, oligosaccharide containing GlcNAc and MurNAc</td>
</tr>
<tr>
<td>29</td>
<td>UDA</td>
<td>GlcNAcβ1-4GlcNAc, Mixture of Man5 to Man9</td>
</tr>
<tr>
<td>30</td>
<td>PWM</td>
<td>(GlcNAcβ1-4)n</td>
</tr>
<tr>
<td>31</td>
<td>Jacalin</td>
<td>Galβ1-3GalNAc, GalNAc</td>
</tr>
<tr>
<td>32</td>
<td>PNA</td>
<td>Galβ1-3GalNAc</td>
</tr>
<tr>
<td>33</td>
<td>WFA</td>
<td>GalNAcβ1-4GlcNAc, Galβ1-3(-6)GalNAc</td>
</tr>
<tr>
<td>34</td>
<td>ACA</td>
<td>Galβ1-3GalNAc</td>
</tr>
<tr>
<td>35</td>
<td>MPA</td>
<td>Galβ1-3GalNAc, GalNAc</td>
</tr>
<tr>
<td>36</td>
<td>HPA</td>
<td>α-linked terminal GalNAc</td>
</tr>
<tr>
<td>37</td>
<td>VVA</td>
<td>α-linked terminal GalNAc, GalNAcα1-3Gal</td>
</tr>
<tr>
<td>38</td>
<td>DBA</td>
<td>blood group A antigen, GalNAcα1-3Gal</td>
</tr>
<tr>
<td>39</td>
<td>SBA</td>
<td>α- or β-linked terminal GalNAc, GalNAcα1-3Gal</td>
</tr>
<tr>
<td>40</td>
<td>Calsepa</td>
<td>Mannose, Maltose</td>
</tr>
<tr>
<td>41</td>
<td>PTL-I</td>
<td>α-linked terminal GalNAc</td>
</tr>
<tr>
<td>42</td>
<td>MAH</td>
<td>Sias2-3Galα1-3(Sias2-6)GalNAc</td>
</tr>
<tr>
<td>43</td>
<td>WGA</td>
<td>chitin oligomers, Sia</td>
</tr>
<tr>
<td>44</td>
<td>GSL-1 A4</td>
<td>α-linked GalNAc</td>
</tr>
<tr>
<td>45</td>
<td>GSL-1 B4</td>
<td>α-linked Gal</td>
</tr>
</tbody>
</table>

Remarks) These data were collected from lectin vendors and reports found by internet searches.

45 different natural Lectins with unique binding properties to carbohydrates

A large lectin-glycan affinity (FAC) database covering more than 10,000 interactions has been disclosed to the public on Aug.19th, 2009.

LecChip™
Variety of samples

- Purified glycoprotein analysis
- Cell/tissue extract analysis
- Direct live cell analysis

(Ab-overlay) lectin microarray
Standard Protocol

Glyco-protein solution

30~60 min.

Fluorescence labeling

90 min. (incl. 60 min incubation)

Lectin Microarray

3~20 h incubation

Scan and digitize

About 15 min.

Analysis

Net Intensity

65,000

60,000

55,000

50,000

45,000

40,000

35,000

30,000

25,000

20,000

15,000

10,000

5,000

0
An Example: CHO vs. Lec1 mutant cells

CHO - Chinese hamster ovary
Lec1 mutant - Defecting in GlcNAc-T1 => resulting in incompletely processed N-Glycans
What changes are observed?

in Lec1 compared with CHO

- Complex N-glycan↓
- Sialic acid↓
- Galactose↓
- Mannose↑
Glycan profiling with **paraffin-embedded tissue arrays**

Super-sensitive: 500 cells were good enough to take these profiling patterns

(A) A scheme of total procedures, (B) Scan images of brain glyoblastoma, stomach adenocarcinoma, colon normal control (N), and adenocarcinoma (T), and (C) The obtained profiling patterns were normalized by a lectin showing the maximum intensity in each case; UDA for brain glyoblastoma, stomach adenocarcinoma and adenocarcinoma (T), and STL for colon normal control (N).

*A. Matsuda et al., Biochemical and Biophysical Research Commun., 370 (2008) 259-263*
Glycan Profiling of Secreted Proteins into Culture Supernatants

NKNT-3: normal cell
NKNT-3/3-9-2: cancer cell

Clear difference in O-glycans

Normalized data

From only 20μL of supernatant

Courtesy of Dr. H. Nakabayashi, Hokkaido Information Univ.
Glycome Profiling of Living Cell Surfaces:

Metabolic labeling with a Cell-Tracker Orange CMRA reagent

Lec1: Lack the glycosyltransferase termed GlcNAc-TI, which produces incomplete intermediates of N-linked carbohydrates
Lec2: Sia-transporter mutant, unable to transport CMP-sialic acid into the golgi compartment
Lec8: Gal-transporter mutant, unable to transport UDP-galactose into the golgi compartment

For any complex glycans (even for mixtures), GlycoStation is able to analyze those epitope images with high throughput, high sensitivity, and high accuracy without cleaving glycans from the carrier proteins.

- **Merits of GlycoStation**
  - No wash process (high repeatability)
  - Real time liquid phase analysis
  - Quantitative analysis without missing any weak interactions
  - For both N- and O-glycans
  - Isomers
- **High Sensitivity (LOD)**
  - 100pg/mL Glycoprotein
  - 100pM Glycan
  - $10^3$ Cell
- **Applicable for crude samples**
- **High Versatility and Applicability**

*N. Uchiyama et al., Proteomics 2008, 8, 3042-3050*
**GlycoStation™ Reader 1200** is an optical scanner component of the system. It scans lectin microarrays ("LecChips") utilizing the principle of evanescent-field fluorescent excitation with high-throughput and high sensitivity.

<table>
<thead>
<tr>
<th>Spec</th>
<th></th>
<th>Appendix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light source</strong></td>
<td>High power white light source</td>
<td>durability: &gt;1500 hours (60% of initial intensity)</td>
</tr>
<tr>
<td><strong>Fluorescent label</strong></td>
<td>Cy3 etc.</td>
<td>Wavelength is selected by a filter</td>
</tr>
<tr>
<td><strong>Control PC</strong></td>
<td>Internal high performance PC, Windows XP</td>
<td></td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>resolution</td>
<td>High resolution 5 μm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>World fastest scanner: &lt; 2min.</td>
</tr>
<tr>
<td></td>
<td>scanning, automatic scanned data saving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>variable exposure time</td>
<td>33.3msec ~ 34.3sec</td>
</tr>
<tr>
<td></td>
<td>variable camera gain</td>
<td>1 ~ 127 (25°C, Max.: 1000Gain)</td>
</tr>
<tr>
<td></td>
<td>continuous scanning</td>
<td>acquisition of scanning pictures at different gain</td>
</tr>
<tr>
<td></td>
<td>hour indicator</td>
<td>Life time of metal halide lamp</td>
</tr>
<tr>
<td><strong>External terminal</strong></td>
<td>USB2 × 3, LAN (1000M) × 1, VGA × 1, Mouse, keyboard terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Input Voltage</strong></td>
<td>AC100V-240V 50/60Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td>650W (body) 450W (light source)</td>
<td></td>
</tr>
<tr>
<td><strong>Size of outward form</strong></td>
<td>W440 × D592 × H585 (mm) (body) W170 × D340 × H225 (mm) (light source)</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>70kg (body), 8.5kg (light source)</td>
<td></td>
</tr>
</tbody>
</table>
## Comparison among Glycan Analysis Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Mass Spectrometry</th>
<th>HPLC</th>
<th>Lectin Microarray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>Glycan cleaving from Protein by PNGase</td>
<td>Glycan cleaving from protein by PNGase</td>
<td>No glycan cleaving from protein</td>
</tr>
<tr>
<td></td>
<td>Purification of cleaved glycans</td>
<td>Gel Filtration</td>
<td>Cy3 labeling and Gel Filtration</td>
</tr>
<tr>
<td></td>
<td>PA labeling and Gel Filtration</td>
<td>PA labeling and Gel Filtration</td>
<td>Incubation on Lectin Microarray</td>
</tr>
<tr>
<td></td>
<td>Mass Spectroscopy</td>
<td>Separation by DEAE(Diethylaminoethyl) Column</td>
<td>Fluorescence Image Scan</td>
</tr>
<tr>
<td></td>
<td>Data analysis and matching</td>
<td>Separation by ODS(Octadecyl Silane)Column</td>
<td>Data Analysis (differential analysis)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Separation by Amide Column</td>
<td>Data analysis and matching</td>
</tr>
<tr>
<td>Protein</td>
<td>100μg</td>
<td>100μg</td>
<td>1μg ~ 10ng Order</td>
</tr>
<tr>
<td>Glycan</td>
<td>only N-glycans</td>
<td>only N-glycans</td>
<td>both N- and O-glycans</td>
</tr>
<tr>
<td></td>
<td>limited performance for O-glycans</td>
<td>limited performance for O-glycans</td>
<td></td>
</tr>
<tr>
<td>Isomers</td>
<td>Poor</td>
<td>So-So</td>
<td>Very GOOD</td>
</tr>
<tr>
<td>Structure Analysis</td>
<td>GOOD (difficult in isomer identification)</td>
<td>GOOD (depend on database size)</td>
<td>Epitope Profiling (not definite identification of detailed glycan structure)</td>
</tr>
<tr>
<td>Processing time</td>
<td>2days</td>
<td>4days</td>
<td>3hours (except for incubation time)</td>
</tr>
<tr>
<td>Price</td>
<td>~US$1M</td>
<td>~US$200,000</td>
<td></td>
</tr>
</tbody>
</table>
**Competition Method** is applicable to some types of samples which are difficult in the labeling → GAG, Glycolipids etc.

![Graphs showing net intensity vs. concentration for 20 HHL, 27 LEL, and 24 TJA-II samples.](image)

- **unlabeled molecule**
- **Labeled standard probe**
• Glycan Profiling Analysis Software

GlycoStation™ ToolsPro Suite 1.5

SignalCapture 1.1

GlycoStationToolsPro 1.5
What we can offer!!

1. Monitoring of Biosimilar Drugs and those Host Cells
2. Glyco-Biomarker Discovery and Development of its Assay Kit
3. Powerful Characterization of Stem Sells and Differentiated Cells
4. Pathological Examination
Biosimilar Drugs

—LecChip is a quickest way—
FDA gave a talk on March 10th about their studies using GlycoStation
Erythropoietin (EPO)

EPO is a glycoprotein hormone that controls erythropoiesis, or red blood cell production. It is a cytokine for erythrocyte (red blood cell) precursors in the bone marrow. Also called hematopoiétin or hemopoietin, it is produced by the liver and kidney, and is the hormone that regulates red blood cell production. When exogenous EPO is used as a performance enhancing drug, it is classified as an erythropoiesis stimulating agent (ESA). Exogenous EPO can often be detected in blood, due to slight difference from the endogenous protein, for example in features of posttranslational modification.

Pharma companies are manufacturing recombinant human EPO (rhEPO) using CHO cells, and distribute it as an injectable preparation drug.

- **Epoietin α**
  (ESPO, Kirin Pharma)

- **Epoietin β**
  (EPOJIN, Chugai Pharma)

- **Danbepoietin α**
  (NESP, Kirin Pharma)
Advent of 2\textsuperscript{nd}-generation EPO - novel erythropoietin stimulating protein (NESP) -

Danbepoietin $\alpha$ (NESP, Kirin Pharma)

「NESP®」is a second generation EPO with modified amino-acid sequence to add more N-glycans.

Comparing with existing rhEPO, NESP has longer lifetime in blood and show lasting hematopoietic effect.

Thereby, NESP shows good anemia correction effect with reduced frequency of administration.
Difference between rhEPO and NESP

<table>
<thead>
<tr>
<th></th>
<th>rhEPO</th>
<th>NESP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>30,400Da</td>
<td>37,100Da</td>
</tr>
<tr>
<td>Max terminal sialic acid residues</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>Percentage of glycan</td>
<td>40%</td>
<td>51%</td>
</tr>
<tr>
<td>Receptor binding affinity</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>Half-life period in blood</td>
<td>short</td>
<td>long</td>
</tr>
<tr>
<td>Hematopoietic effect</td>
<td>weak</td>
<td>strong</td>
</tr>
</tbody>
</table>

（Pharmacological and clinical profiles of long-lasting erythropoietin（darbepoetin alfa; NESP®）, Nobuo Nagano, 日薬理誌 (Folia Pharmacol, Jpn.) 131, 291～299）
These two products, rhEPOs, show very similar glycan profiles, except for some difference in fucosylation (see AAL).

* Normalized by UDA
Fucosylation is also different between ESPO and NESP (see AAL). Characteristic glycan structures expressed on 2nd-Generation EPO are expressed by PHA(L), LEL and STL.

**PHA(L):** tetra-antennary N-glycan

**LEL:** polylactosamine

**STL:** GlcNAc

N-glycan terminal is strongly sialylated (see **MAL_I:** α2-3Sia)

* Normalized by UDA
• **Glycan Structure of h-IgG**
  - 2 N-glycans (on H-chain, C_H2), important to keep the steric structure
  - Glycan structure is very heterogeneous, but its relative ratio is stable in healthy persons.

• **IgG as an therapeutic protein**
  - ADCC activity
    IgG without core Fuc has 100 times higher ADCC activity.
  Potelligent Technology by Kyowa-Kirin
Quick Turnaround Time

Adjusting to a most desired glycan structure

- Selection of a suitable clone
- Tuning of culture conditions
Antigenicity of Mab

- Red bars: Mab-1
- Blue bars: Reference Protein without α-Gal

α-Gal
Glyco-Biomarker

—LecChip is a short-cut—
Basic Concept to Investigate Glycan-related Bio-markers

- Glycoprotein from Normal cells
- Core proteins are identical
- Glycoprotein from Abnormal cells

Differentiation

Disease, or development specific glycans
Glycosylation patterns will be altered, if differentiation stages or malignancy of the cells are different (e.g., AFP-L3)

Hepatitis
Hepatocirrosis

Hepato-cellular cancer

AFP
AFP
AFP
AFP

Y
Y
Y
Y

LCA (lectin)

Fucose

anti-AFP antibody
Multilectin Assay for Detecting Fibrosis-Specific Glyco-Alterration by Means of Lectin Microarray

The core protein is AGP

Obtained Sensitivity and Specificity are higher than 80%


Basic Glyco-BioMarker Development Pipeline

Lectin Array Analysis

The most suspicious glycan changes and key lectins

SDS-PAGE 2D Electrophoresis ↔ LC-MS

Identification of Carrier Proteins

Screening of 1st set of Marker Candidates

High throughput Screening (Antibody-overlay Lectin Microarray)

Narrowing down Marker Candidates

Searching papers And Database

Lectin-ELISA Assay

Large Scale Validation
Regenerative Medicine
—LecChip classifies Cells—
Lectin is not so special in Defining human stem cells

Hematopoietic stem cell: WGA, CD34, CD133

Neural stem cell: LeX/SSEA-1, CD133

ES cell and iPS cell: Tra-1-60, Tra-1-81, SSEA-4

Endothelial cell: UEA-1

A. Umezawa, NCCHD
Clustering Analysis of hMSC and EC

LecChip can identify those tissue origins

Lectin microarray analysis of pluripotent and multipotent stem cells, M. Toyoda et al., Genes to Cells 16, pp1-11 (2011)
Specific lectin biomarkers for isolation of human pluripotent stem cells identified through array-based glycome analysis, Yu-Chieh Wang, Shinya Yamanaka, Jeanne Loring et al., Cell Research advance online publication 6 September 2011; doi:10.1038/cr.2011.148(2011)

Pluripotent iPS, ES cells are clearly discriminated by LecChips

Differentiated cells
In order to reduce risks with this technol.
Probiotics

—Intestinal Bacteria—

Intestinal Bacteria enhances production of IgA and also immunological tolerance
Glycan Profiling of Lactobacillus

1. Cell labeling
   - SYTOX Orange (10 μM)
   - (RT, 5 min)

2. Cell binding
   - Lectin microarray
   - (4°C, 1 h)

3. Wash in PBS
   - (4°C, 1 h)

4. Detection by evanescent field fluorescence

Lectin Microarray Reveals Binding Profiled of Lactobacillus casei Strains in a Comprehensive Analysis of Bacterial Cell Wall Polysaccharides, E. Yasuda et. Al. Applied and Environmental Microbiology, July 2011, p.4539-4546
Other Applications

—LecChip identifies Malignancy—
What medical treatments I should apply?

As a secondary criterion of pathological examination to judge cancer malignant grade, through differential glycan profiling of biopsy samples.

A reported example: uterine corpus cancer, G1, G2, and G3
G1=respond to anticancer drugs
G3=not respond to anticancer drugs

Identify types of ATL diseases from T-Cell

PBL-M, PBL-I: CD3+, CD4+ Helper T-cells, Health persons
ATL4, ATL9: ATL patient’s peripheral blood cells
C8166, ED: CD25+ HTLV-1 transformed cells

H. Iha et al., Bio Clinia Vo.26, No.10, Sep.2011, pp54-57
Summary

GlycoStation™ is the quickest and easiest Glycan Structure Profiling Analysis System with high sensitivity and high throughput in a various fields.

- For R&D use,
- For development of Glyco-Biomarkers,
- For evaluation of Biosimilars,
- For Stem Cell characterization, and
- For Pathological examination
for your success!!

Glycan Profiling technologies and Services

GlycoBiomarker  Therapeutic Proteins
Stem Cells
Diagnosis

Simple & Quick to use