

# RayBio<sup>®</sup> Human Glycosylation Antibody Array 2000

For the simultaneous detection of the glycosylation protein profile of 2000 human proteins in serum, plasma, cell culture supernatants, cell/tissue lysates or other body fluids.

## User Manual (Revised Nov. 6<sup>th</sup>, 2020)

Human Glycosylation Array 2000  
Cat# GAH-GCM-2000-4 (4 Sample Kit)  
Cat# GAH-GCM-2000-8 (8 Sample Kit)

**Please read manual carefully  
before starting experiment**



**Your Provider of Excellent Protein Array Systems and Services**

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## I. Introduction

Glycosylation is the addition of sugar molecules onto cellular proteins, lipids, and polysaccharides that results from a co- and post-translational modification. Recent appreciation of glycosylation changes on the cell surface have been linked to numerous cellular diseases, most notably in several cancers. Understanding the changes that occur in the cellular process of molecule glycosylation can unveil new biomarkers of disease or pave the way for new drug targets.

Recent technological advances by RayBiotech have enabled the largest commercially available glycosylation antibody array to date. With the Human Glycosylation Array 2000, researchers can now efficiently obtain glycosylation profiles in their samples. This assay allows the simultaneous detection of glycosylation profiles of 2000 human proteins, including, but not limited to, cytokines, chemokines, adipokines, growth factors, angiogenic factors, proteases, soluble receptors, soluble adhesion molecules in cell culture supernatants, serum, plasma and other samples types. Using a set of 5 lectins that recognize a broad array of glycosylation moieties on the surface of proteins, this assay allows researchers to identify glycosylation changes on the surface of these proteins directly.

### How it Works

Capture antibodies for the 2000 proteins are printed onto glass slides and the glycans on these capture antibodies are removed. The glass slide arrays come pre-blocked and are ready to be incubated with samples. After incubation with samples and washing to remove unbound proteins, five unique biotin-labeled lectins are incubated with the array. These lectins bind their respective glycan moieties on the captured proteins present on the glass surface. Streptavidin-conjugated fluorescent dye (Cy3 equivalent) is then added to the array which recognizes the biotin attached to any bound lectin molecule. Finally, the glass slide is dried and laser fluorescence scanning is used to visualize the signals. These signals are then compared to the array map to identify glycosylated proteins present in the samples.

## II. Materials Provided

### A. Storage Recommendations

Upon receipt, the kit should be stored at -20°C until needed. Use within 6 months from the date of shipment is recommended. After initial use, remaining reagents should be stored at 4°C and may be stored for up to 3 months. Unused glass slides should be kept at -20°C and repeated freeze-thaw cycles should be avoided (slides may be stored for 6 months).

ITEM	DESCRIPTION	Cat# GAH-GCM-2000-4	Cat# GAH-GCM-2000-8
A	RayBio® GAH-Series Human Antibody Array L-2000 Glass Slides*	1 GCM-507 slide	2 GCM-507 slides
		1 GCM-493 slide	2 GCM-493 slides
		1 GSM-L-3 slide	2 GSM-L-3 slides
		1 GSM-L-4 slide	2 GSM-L-4 slides
B	Dilution Buffer	4 bottles (8 ml/ea)	6 bottles (8 ml/ea)
D	20X Wash Buffer I	2 bottle (30 ml)	4 bottles (30 ml/ea)
E	20X Wash Buffer II	2 bottle (30 ml)	4 bottles (30 ml/ea)
F	Cy3-Conjugated Streptavidin	2 vials	4 vials
G	Biotin-labeled Lectin Mixture**	8 vials	16 vials
H	Adhesive Plastic Strips	4	8
M	30 mL Centrifuge Tube	1	2

\*Each slide contains 4 identical subarrays

\*\* See page 14 for lectin mixture composition

### B. Additional Materials Required

- ddH<sub>2</sub>O
- Small plastic or glass containers
- Orbital shaker or oscillating rocker
- 1 mL tube
- Pipettors, pipette tips and other common lab consumables
- Laser scanner for fluorescence detection (list available online)
- Aluminum foil

### III. Overview and General Considerations

#### A. Preparation and Storage of Samples

##### 1) Preparation of Cell Culture Supernatants

1. Seed cells at a density of  $1 \times 10^6$  cells in 100 mm tissue culture dishes.\*
2. Culture cells in complete culture medium for ~24–48 hours. \*\*
3. Replenish with serum-free or low-serum medium such as 0.2% FCS/FBS serum, and then incubate cells again for ~48 hours. \*\* If high serum medium such as 10% FCS/FBS is used, high background can occur on glass slide arrays due to serum interactions with the slide surface.
4. To collect supernatants, centrifuge at 1,000 g for 10 min and store as  $\leq 1$  ml aliquots at  $-80^\circ\text{C}$  until needed.
5. Measure the total wet weight of cultured cells in the pellet and/or culture dish. You may then normalize between arrays by dividing fluorescent signals by total cell mass (i.e., express results as the relative amount of protein expressed/mg total cell mass). Or you can normalize between arrays by determining cell lysate concentration using a total protein assay (BCA Protein Assay Kit, Pierce, Prod #: 23227).

*\*The density of cells per dish used is dependent on the cell type. More or less cells may be required.*

*\*\*Optimal culture time may vary and will depend on the cell line, treatment conditions and other factors.*

## 2) Extracting Protein from Cells

### 1. Centrifuge Cells:

#### a. Adherent Cells:

- i. Remove supernatant from cell culture and wash cells gently twice with cold 1X PBS taking care not to disturb cell layer.
- ii. Add enough cold 1X PBS to cover cell layer and use cell scraper to detach cells. Proceed to 1b. Cells in Suspension.

#### b. Cells in Suspension: Pellet the cells by centrifugation using a microcentrifuge at 1500 rpm for 10 min.

2. Make sure to remove any remaining PBS before adding cell lysis buffer. Solubilize the cells at  $2 \times 10^7$  cells/ml lysis buffer.

**Note: We recommend RayBio® 2X Cell Lysis Buffer (Cat# AA-LYS) or another lysis buffer suitable for immunoprecipitations. We also recommend supplementing the buffer with a protease inhibitor cocktail prior to homogenization.**

3. Pipette up and down to resuspend cells and rock the lysates gently at 2–8 °C for 30 minutes. Transfer extracts to microfuge tubes and centrifuge at 13,000 rpm for 10 min at 2-8 °C.

**Note: If the lysates appear to be cloudy, transfer the lysates to a clean tube, centrifuge again at 13,000 rpm for 20 minutes at 2-8°C. If the lysates are still not clear, store them at -20°C for 20 minutes. Remove from the freezer and immediately centrifuge at 13,000 rpm for 20 minutes at 2-8°C.**

4. Transfer lysates to a clean tube. Determine cell lysate concentrations using a total protein assay (BCA Protein Assay Kit, Pierce, Prod# 23227). Aliquot the lysates and store at -80°C.

### 3) Extracting Protein from Crude Tissue

1. Transfer approximately 100 mg crude tissue into a tube with 1 ml lysis buffer.
2. Homogenize the tissue according to homogenizer manufacturer instructions.
3. Transfer extracts to microcentrifuge tubes and centrifuge for 20 min at 13,000 rpm (4°C).

**Note:** *If the supernatant appears to be cloudy, transfer the supernatants to a clean tube, centrifuge again at 13,000 rpm for 20 minutes at 2-8°C. If the supernatant is still not clear, store the lysate at -20°C for 20 minutes. Remove from the freezer, immediately centrifuge at 13,000 rpm for 20 minutes at 2-8°C.*

4. Transfer supernatant to a clean tube and store at -80°C.

### **B. Handling the Glass Slides**

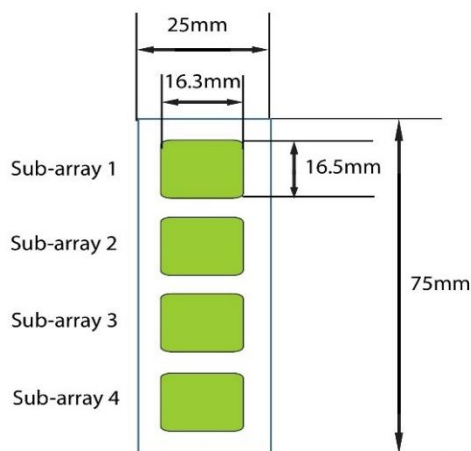
- The microarray slides are delicate. Please do not touch the array surface with pipette tips, forceps or your fingers. Hold the slides by the edges only.
- Handle the slides with powder-free gloves and in a clean environment.
- Do not remove the glass slide from the chamber assembly until step 14 on page 10, and take great care not to break the glass slide when doing so.
- Remove reagents/sample by gently applying suction with a pipette to corners of each chamber. Do not touch the printed area of the array, only the sides as seen in image below.



### C. Layout of Human Glycosylation Array 507, 493, L-3 and L-4 Glass Slides



Four identical sub-arrays on one slide



4 printed sub-arrays per glass chip

### D. Incubations and Washes

- During incubations and washes, cover incubation chamber with a Plastic Adhesive Strip (Item H) to prevent evaporation, particularly those incubations lasting 2 hours or longer.
- During incubation and wash steps avoid foaming and be sure to remove all bubbles from the sub-array surface.
- Perform all incubation and wash steps with a gentle rocking motion (~0.5 to 1 cycle/sec).
- Wash steps in Wash Buffer II and all incubation steps may be performed overnight at 4°C, with gentle rocking.
- Avoid cross-contamination of samples to neighboring wells. To remove Wash Buffers and other reagents from chamber wells, you may invert the Glass Slide Assembly to decant, and aspirate the remaining liquid.

- Unlike most Cy3 fluors, the HiLyte Plus™ 555 used in this kit is very stable at RT and resistant to photobleaching on the hybridized glass slides. However, please protect glass slides from strong direct light and temperatures above RT.

## IV. Protocol

### A. Drying of the Glass Slide

1. Remove the package containing the assembled glass slides (Item A) from the freezer. Place unopened packages on the bench top for approx. 15 min, and allow the assembled glass slides to equilibrate to RT.
2. Open packages and take the assembled glass slides out of the sleeve (do not disassemble the glass slide from the chamber assembly). Place glass slide assemblies in laminar flow hood or similar clean environment for 1-2 hours at RT.

*Note: Protect the slide from dust or other contaminants.*

### B. Incubations

***Note: Glass slides should be completely dry before continuing with this procedure.***

3. Immediately prior to sample incubation, centrifuge samples for 5 min at 10,000 rpm to remove any particulates or precipitates. Dilute samples with 1X Dilution Buffer (Item B). Recommended dilution of samples with Blocking Buffer is 2-10 fold for serum/plasma and cell culture supernatants or body fluid, 100-500ug/ml (total protein concentration) for cell/tissue lysate.

**Note: Optimal sample dilution factor will depend on the abundance of target proteins. If the background or antigen-specific antibody signals are too strong, the sample can be diluted further in subsequent experiments. If the signal is too weak, more concentrated samples can be used.**

4. Add 400  $\mu$ l of diluted sample into each well of slides. Remove any bubbles on array surfaces. Incubate arrays with gentle rocking for 2 hours at RT or overnight at 4°C.

**Note: Avoid sample flow through into neighboring wells.**

5. Dilute 20X Wash Buffer I Concentrate (Item D) 20-fold with ddH<sub>2</sub>O. Decant the samples from each well, and wash 3 times with 800  $\mu$ l of 1X Wash Buffer I at RT with gentle rocking for 5 min per wash.
6. Obtain a clean container (e.g., pipette tip box or slide-staining jar), place the assembled glass slides into the container with enough volume of 1X Wash Buffer I to completely cover the entire assembly, and remove any bubbles in wells. Wash 2 times at RT with gentle rocking for 10 min per wash.
7. Dilute 20X Wash Buffer II Concentrate (Item E) 20-fold with ddH<sub>2</sub>O. Decant the Wash Buffer I from Step 6. Place the assembled glass slides into the container with enough volume of 1X Wash Buffer II to completely cover the entire assembly, and remove any bubbles in wells. Wash 2 times at RT with gentle rocking for 5 min per wash.
8. Prepare Biotin-labeled Lectin Mixture (Item G): Add 1 mL 1x Dilution Buffer directly into the tube Item G. Pipette up and down gently to mix and then pipette 400  $\mu$ L into each well on the array slide.
9. Incubate slide at RT with gentle rocking for 45-50 minutes.

10. Repeat washing steps from Step 5 to Step 7.
11. Prepare 1X Cy3-Conjugated Streptavidin:
  - a. Briefly spin down tube containing the Cy3-Conjugated Streptavidin (Item F) immediately before use.
  - b. Add 1000  $\mu$ l of Dilution Buffer (Item B) into the tube to prepare a concentrated Cy3-Conjugated Streptavidin stock solution. Pipette up and down to mix gently (do not store the stock solution for later use).
  - c. To prepare 1X Cy3-Conjugated Streptavidin, add 400  $\mu$ l of the concentrated Cy3-Conjugated Streptavidin stock solution into a tube with 1600  $\mu$ l of Dilution Buffer (Item B). Mix gently.
12. Carefully remove Assembled Glass Slide from container. Remove all of Wash Buffer II from the wells. Add 400  $\mu$ l of 1X Cy3-Conjugated Streptavidin to each sub-array. Cover the incubation chamber with the plastic adhesive strips.

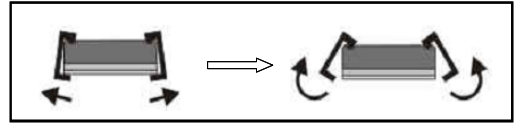
**Note: Avoid exposure to light in Steps 13-20 by covering the Glass Slide Assemblies with aluminum foil or incubate in dark room.**

13. Incubate with Cy3-Conjugated Streptavidin at RT for 2 hours with gentle rocking.

**Note: Incubation may be done overnight at 4°C with gentle rocking.**

14. Decant the solution and disassemble the glass slides from the incubation frame and chamber. Disassemble the device by pushing clips outward from the side, as shown below. Carefully remove the glass slide from the gasket.

**Note: Be careful not to touch the printed surface of the glass slide, which is on the same side as the barcode.**



15. Gently place the glass slide into the 30 ml Centrifuge Tube (Item I). Add enough 1X Wash Buffer I to cover the entire glass slide. Wash with gentle rocking for 10 min. Remove Wash Buffer I. Repeat 2 times for a total of 3 washes.
16. Repeat step 15 with 1X Wash Buffer II. Repeat one time with Wash Buffer II, for a total of two washes for 5 min per wash.
17. Finally, wash the glass slide with 30 ml of ddH<sub>2</sub>O for 5 min with gentle rocking. Remove glass slide and decant water from Centrifuge Tube.
18. Remove water droplets from slide by applying suction gently with a pipette tip.

**Note: Be careful not to touch the array portions of the slide with your pipette tip, only touch the sides of the slide.**

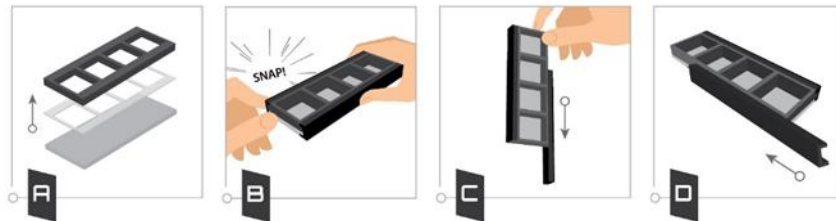
### **C. Fluorescence Detection**

19. Allow glass chip to dry in a laminar flow hood protected from light for 20 minutes or until slide is completely dry. Place chip under an aluminum foil tent to protect it from light. Make sure the slides are absolutely dry before scanning or storage.
20. You may proceed immediately to scanning, or you may store the slide at -20 °C in the Centrifuge Tube provided or at RT and to scan at a later time.

**Note: Please protect glass slides from temperatures above RT and store them in the dark protected from light. Do not expose glass slide to strong light, such as sunlight or a UV lamp.**

**Note: If you need to repeat any of the incubations after finishing the experiment, you must first re-assemble the glass slide into the incubation chamber by following step as shown in the figures below. To avoid breaking the printed glass slide, you may first want to practice assembling the device with a blank glass slide.**

1. Apply slide to incubation chamber barcode facing upward as in image A (below).
2. Gently snap one edge of a snap-on side as shown in image B.
3. Gently press other of side against lab bench and push in lengthwise direction (image C).
4. Repeat with the other side (image D)





## B. RayBio® Human Glycosylation Antibody Array 507 target List

Number	Name	Number	Name	Number	Name	Number	Name	Number	Name
1	Positive 1a	61	CCR7	121	Eotaxin-2 / MIPF-2	181	GFR alpha-2	241	IL-1 R6 / IL-1 Rrp2
2	Positive 2a	62	CCR8	122	Eotaxin-3 / CCL26	182	GFR alpha-3	242	IL-1 R8
3	Positive 3a	63	CCR9	123	Eprexulin	183	GFR alpha-4	243	IL-1 R9
4	neg	64	CD14	124	ErbB2	184	GITR / TNFRF18	244	IL-1 ra
5	6Ckine	65	CD27 / TNFRSF7	125	ErbB3	185	GITR Ligand / TNFSF18	245	IL-1 sRI
6	Activin A	66	CD30 / TNFRSF8	126	ErbB4	186	Glucagon	246	IL-1 sRII
7	Activin B	67	CD30 Ligand / TNFSF8	127	Erythropoietin	187	Glut1	247	IL-2
8	Activin C	68	CD40 / TNFRSF5	128	E-Selectin	188	Glut2	248	IL-2 R alpha
9	Activin RIA / ALK-2	69	CD40 Ligand / TNFSF5 / CD154	129	FADD	189	Glut3	249	IL-2 R beta / CD122
10	Activin RIB / ALK-4	70	CD 163	130	FAM3B	190	Glut5	250	IL-2 R gamma
11	Activin RII A/B	71	Cerberus 1	131	Fas / TNFRSF6	191	Glypican 3	251	IL-3
12	Activin RIIA	72	Chem R23	132	Fas Ligand	192	Glypican 5	252	IL-3 R alpha
13	Adiponectin / Acrp30	73	Chordin-Like 1	133	FGF Basic	193	GM-CSF	253	IL-4
14	AgRP	74	Chordin-Like 2	134	FGF-BP	194	GM-CSF R alpha	254	IL-4 R
15	ALCAM	75	CLC	135	FGF R3	195	Granzyme A	255	IL-5
16	Angiogenin	76	CNTF	136	FGF R4	196	GREMLIN	256	IL-5 R alpha
17	Angiopoietin-1	77	CNTF R alpha	137	FGF R5	197	GRO	257	IL-6
18	Angiopoietin-2	78	Coagulation Factor III / Tissue Factor	138	FGF-4	198	GRO-a	258	IL-6 R
19	Angiopoietin-4	79	CRIM 1	139	FGF-5	199	Growth Hormone (GH)	259	IL-7
20	Angiopoietin-like 1	80	Cripto-1	140	FGF-6	200	Growth Hormone R (GHR)	260	IL-7 R alpha
21	Angiopoietin-like 2	81	CRTH-2	141	FGF-7 / KGF	201	HB-EGF	261	IL-8
22	Angiopoietin-like Factor	82	Cryptic	142	FGF-8	202	HCC-4 / CCL16	262	IL-9
23	Angiostatin	83	Csk	143	FGF-9	203	HCR / CRAM-A/B	263	IL-10
24	APJ	84	CTACK / CCL27	144	FGF-10 / KGF-2	204	Hepassocin	264	IL-10 R alpha
25	APRIL	85	CTGF / CCN2	145	FGF-11	205	GLO-1	265	IL-10 R beta
26	AR (Amphiregulin)	86	CTLA-4 / CD152	146	FGF-12	206	HGF	266	IL-11
27	Artemin	87	CV-2 / Crossveinless-2	147	FGF-13 1B	207	HGFR	267	IL-12 p40
28	Axl	88	CXCL14 / BRAK	148	FGF-16	208	HRG-alpha	268	IL-12 p70
29	B7-1 / CD80	89	CXCL16	149	FGF-17	209	HRG-beta 1	269	IL-12 R beta 1
30	BAFF R / TNFRSF13C	90	CXCR1 / IL-8 RA	150	FGF-18	210	HVEM / TNFRSF14	270	IL-12 R beta 2
31	BCMA / TNFRSF17	91	CXCR2 / IL-8 RB	151	FGF-19	211	I-309	271	IL-13
32	BD-1	92	CXCR3	152	FGF-20	212	ICAM-1	272	IL-13 R alpha 1
33	BDNF	93	CXCR4 (fusin)	153	FGF-21	213	ICAM-2	273	IL-13 R alpha 2
34	beta-Catenin	94	CXCR5 / BLR-1	154	FGF-23	214	ICAM-3 (CD50)	274	IL-15
35	BAX	95	CXCR6	155	FLRG	215	ICAM-5	275	IL-15 R alpha
36	beta-NGF	96	D6	156	Flt-3 Ligand	216	IFN-alpha / beta R1	276	IL-16
37	BIK	97	DAN	157	Follistatin	217	IFN-alpha / beta R2	277	IL-17
38	BLC / BCA-1 / CXCL13	98	DANCE	158	Follistatin-like 1	218	IFN-beta	278	IL-17B
39	BMP-2	99	Dcr3 / TNFRSF6B	159	Fractalkine	219	IFN-gamma	279	IL-17B R
40	BMP-3	100	Decorin	160	Frizzled-1	220	IFN-gamma R1	280	IL-17C
41	BMP-3b / GDF-10	101	Dkk-1	161	Frizzled-3	221	IGFBP-1	281	IL-17D
42	BMP-4	102	Dkk-3	162	Frizzled-4	222	IGFBP-2	282	IL-17E
43	BMP-5	103	Dkk-4	163	Frizzled-5	223	IGFBP-3	283	IL-17F
44	BMP-6	104	DR3 / TNFRSF25	164	Frizzled-6	224	IGFBP-4	284	IL-17R
45	BMP-7	105	DR6 / TNFRSF21	165	Frizzled-7	225	IGFBP-6	285	IL-17RC
46	BMP-8	106	Dtk	166	Galectin-3	226	IGFBP-1p1 / IGFBP-7	286	Positive 1b
47	BMP-15	107	EDA-A2	167	GASP-1 / WFIKKNRP	227	IGF-I	287	Positive 2b
48	BMPR-IA / ALK-3	108	EDAR	168	GASP-2 / WFIKKN	228	IGF-I SR	288	Positive 3b
49	BMPR-IB / ALK-6	109	EDG-1	169	GCP-2 / CXCL6	229	IGF-II	289	neg
50	BMPR-II	110	EGF	170	GCSF	230	IGF-II R	290	IL-17RD
51	BTC	111	EGF R / ErbB1	171	G-CSF R / CD 114	231	IL-1 alpha	291	IL-18 BPa
52	Cardiotrophin-1 / CT-1	112	EG-VEGF / PK1	172	GDF1	232	IL-1 beta	292	IL-18 R alpha / IL-1 R5
53	CCL14 / HCC-1 / HCC-3	113	EMAP-II	173	GDF3	233	IL-1 F5 / FIL1delta	293	IL-18 R beta / AcPL
54	CCL28 / VIC	114	ENA-78	174	GDF5	234	IL-1 F6 / FIL1 epsilon	294	IL-19
55	CCR1	115	Endocan	175	GDF8	235	IL-1 F7 / FIL1 zeta	295	IL-20
56	CCR2	116	Endoglin / CD105	176	GDF9	236	IL-1 F8 / FIL1 eta	296	IL-20 R alpha
57	CCR3	117	Endostatin	177	GDF11	237	IL-1 F9 / IL-1 H1	297	IL-20 R beta
58	CCR4	118	Endothelin	178	GDF-15	238	IL-1 F10 / IL-1HY2	298	IL-21
59	CCR5	119	EN-RAGE	179	GDNF	239	IL-1 R3 / IL-1 R AcP	299	IL-21 R
60	CCR6	120	Eotaxin / CCL11	180	GFR alpha-1	240	IL-1 R4 / ST2	300	IL-22



# RayBio® Human Glycosylation Antibody Array 507 Target List

## ...continued

Number	Name	Number	Name	Number	Name	Number	Name
301	IL-22 BP	361	MMP-2	421	RANK / TNFRSF11A	481	TMEFF1 / Tomoregulin-1
302	IL-22 R	362	MMP-3	422	RANTES	482	TMEFF2
303	IL-23	363	MMP-7	423	RELM beta	483	TNF-alpha
304	IL-23 R	364	MMP-8	424	RELT / TNFRSF19L	484	TNF-beta
305	IL-24	365	MMP-9	425	ROBO4	485	TNF RI / TNFRSF1A
306	IL-26	366	MMP-10	426	S100 A8/A9	486	TNF RII / TNFRSF1B
307	IL-27	367	MMP-11 / Stromelysin-3	427	S100A10	487	TRADD
308	IL-28A	368	MMP-12	428	SAA	488	TRAIL / TNFSF10
309	IL-29	369	MMP-13	429	SCF	489	TRAIL R1 / DR4 / TNFRSF10A
310	IL-31	370	MMP-14	430	SCF R / CD117	490	TRAIL R2 / DR5 / TNFRSF10B
311	IL-31 RA	371	MMP-15	431	SDF-1 / CXCL12	491	TRAIL R3 / TNFRSF10C
312	BACE-1	372	MMP-16 / MT3-MMP	432	sFRP-1	492	TRAIL R4 / TNFRSF10D
313	FACX	373	MMP-19	433	sFRP-3	493	TRANCE
314	Insulin	374	MMP-20	434	sFRP-4	494	TREM-1
315	Insulin R	375	MMP-24 / MT5-MMP	435	sgp130	495	TROY / TNFRSF19
316	Insulysin / IDE	376	MMP-25 / MT6-MMP	436	SIGIRR	496	TSG-6
317	IP-10	377	MSP alpha Chain	437	Siglec-5/CD170	497	TSLP R
318	I-TAC / CXCL11	378	Musk	438	Siglec-9	498	TWEAK / TNFSF12
319	Kininostatin / kininogen	379	NAP-2	439	SLPI	499	TWEAK R / TNFRSF12
320	Kremen-1	380	NCAM-1 / CD56	440	Smad 1	500	Ubiquitin+1
321	Kremen-2	381	Neuritin	441	Smad 4	501	uPA
322	Latent TGF-beta bp1	382	NeuroD1	442	Smad 5	502	uPAR
323	LBP	383	Neuropilin-2	443	Smad 7	503	Vasorin
324	Lck	384	Neurturin	444	Smad 8	504	VCAM-1 (CD106)
325	LECT2	385	NGF R	445	Prdx6	505	VE-Cadherin
326	Lefty - A	386	Nidgen-1	446	Soggy-1	506	VEGF
327	Leptin (OB)	387	NOV / CCN3	447	Sonic Hedgehog (Shh N-terminal)	507	VEGF R2 (KDR)
328	Leptin R	388	NrCAM	448	SPARC	508	VEGF R3
329	LFA-1 alpha	389	NRG1 Isoform GGF2	449	Spinesin	509	VEGF-B
330	LIF	390	NRG2	450	TACI / TNFRSF13B	510	VEGF-C
331	LIF R alpha	391	NRG3	451	Tarc	511	VEGF-D
332	LIGHT / TNFSF14	392	NT-3	452	TCCR / WSX-1	512	VEGI / TNFSF15
333	Lipocalin-1	393	NT-4	453	TECK / CCL25	513	WIF-1
334	Lipocalin-2	394	Orexin A	454	TFPI	514	WISP-1 / CCN4
335	LRP-1	395	Orexin B	455	TGF-alpha	515	XEDAR
336	LRP-6	396	OSM	456	TGF-beta 1	516	Neg
337	L-Selectin (CD62L)	397	Osteoactivin / GPNMB	457	TGF-beta 2	517	Neg
338	Lymphotactin / XCL1	398	Osteonin	458	TGF-beta 3	518	Neg
339	Lymphotoxin beta / TNFSF3	399	Osteoprotegerin / TNFRSF11B	459	TGF-beta 5	519	Neg
340	Lymphotoxin beta R / TNFRSF3	400	OX40 Ligand / TNFSF4	460	TGF-beta RI / ALK-5	520	Neg
341	MAC-1	401	PARC / CCL18	461	TGF-beta RII	521	Neg
342	MCP-1	402	PD-ECGF	462	Grb2	522	Neg
343	MCP-2	403	PDGF R alpha	463	TGF-beta RIII	523	P-3c
344	MCP-3	404	PDGF R beta	464	Thrombopoietin (TPO)	524	P-2c
345	MCP-4 / CCL13	405	PDGF-AA	465	TPX	525	P-1c
346	M-CSF	406	PDGF-AB	466	Thrombospondin-1		
347	M-CSF R	407	PDGF-BB	467	Thrombospondin-2		
348	MDC	408	PDGF-C	468	Thrombospondin-4		
349	MFG-E8	409	PDGF-D	469	Thymopoietin		
350	MFRP	410	PECAM-1 / CD31	470	Tie-1		
351	MICA	411	Pentraxin3 / TSG-14	471	Tie-2		
352	MIF	412	Persephin	472	TIMP-1		
353	MIG	413	PF4 / CXCL4	473	TIMP-2		
354	MIP-1a	414	PIGF	474	TIMP-3		
355	MIP-1b	415	PLUNC	475	TIMP-4		
356	MIP-1d	416	Pref-1	476	TL1A / TNFSF15		
357	MIP 2	417	Progranulin	477	TLR1		
358	MIP-3 alpha	418	Prolactin	478	TLR2		
359	MIP-3 beta	419	P-selectin	479	TLR3		
360	MMP-1	420	RAGE	480	TLR4		

# C. RayBio<sup>®</sup> Human Glycosylation Antibody Array 493 Map

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	P-1a	P-1a	P-2a	P-2a	P-3a	P-3a	Neg	Neg	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15
2	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30	30
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5	61	61	62	62	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75
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20	P-1b	P-1b	P-2b	P-2b	P-3b	P-3b	Neg	Neg	290	290	291	291	292	292	293	293	294	294	295	295	296	296	297	297	298	298	299	299	300	300
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25	361	361	362	362	363	363	364	364	365	365	366	366	367	367	368	368	369	369	370	370	371	371	372	372	373	373	374	374	375	375
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27	391	391	392	392	393	393	394	394	395	395	396	396	397	397	398	398	399	399	400	400	401	401	402	402	403	403	404	404	405	405
28	406	406	407	407	408	408	409	409	410	410	411	411	412	412	413	413	414	414	415	415	416	416	417	417	418	418	419	419	420	420
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34	496	496	497	497	498	498	499	499	500	500	501	501	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	Neg	P-3c	P-3c	P-2c	P-2c	P-1c	P-1c

## D. RayBio® Human Glycosylation Antibody Array 493 Target List

Number	Name	Number	Name	Number	Name	Number	Name	Number	Name
1	Positive-1a	61	ApoE3	121	Ceruloplasmin	181	EpCAM	241	GPR-39
2	Positive-2a	62	ApoD	122	CFHR2	182	EphA1	242	GPX1
3	Positive-3a	63	ApoM	123	Chemerin	183	EphA2	243	GPX3
4	Blank	64	ApoH	124	CHI3L1	184	EphA3	244	Pancreastatin
5	11b-HSD1	65	APP	125	Chromogranin A	185	EphA4	245	GRP
6	2B4	66	ASPH	126	Chymase	186	EphA5	246	GRP75
7	4-1BB	67	Attractin	127	ciAP-2	187	EphA6	247	GRP78
8	ABL1	68	B3GNT1	128	Ck beta 8-1	188	EphA7	248	GSR
9	ACE	69	BAF57	129	CK-MB	189	EphA8	249	GST
10	ACE-2	70	BAFF	130	Claudin-3	190	EphB1	250	HADHA
11	ACK1	71	BAI-1	131	Claudin-4	191	EphB2	251	HAI-1
12	ACPP	72	BCAM	132	CLEC3B	192	EphB3	252	HAI-2
13	ACTH	73	Beta 2M	133	Clusterin	193	EphB4	253	hCG alpha
14	ADAM-9	74	Beta Defensin 4	134	CNDP1	194	EphB6	254	hCGb
15	Neurokinin-A	75	Beta IG-H3	135	Factor XIII A	195	ERRA	255	Hck
16	ADAMTS-1	76	Biglycan	136	Factor XIII B	196	Erythropoietin R	256	HE4
17	ADAMTS-L2	77	BLAME	137	COCO	197	ESAM	257	Hemopexin
18	ADAMTS-4	78	BMP-9	138	C2	198	EV15L	258	Hepcidin
19	ADAMTS-5	79	BMX	139	C3a	199	EXTL2	259	HSP32
20	ADAMTS-10	80	BNIP2	140	C5/C5a	200	FABP1	260	HOXA10
21	ADAMTS-13	81	Btk	141	C7	201	FABP2	261	Haptoglobin
22	ADAMTS-15	82	ApoC1	142	C8B	202	FABP4	262	HSP10
23	ADAMTS-17	83	CA 9	143	C9	203	FAK	263	HSP20
24	ADAMTS-18	84	CA 15-3	144	Complement factor H	204	FAP	264	HSP27
25	ADAMTS-19	85	CA 19-9	145	Contactin-1	205	Fc RIIB/C	265	HSP40
26	Adipsin	86	CA 125	146	Contactin-2	206	Fen 1	266	HSP60
27	Afamin	87	Cadherin-13	147	Corticosteroid-binding globulin	207	FER	267	HSP70
28	AFP	88	Calbindin	148	COX-2	208	Ferritin	268	HSP90
29	ALBUMIN	89	Calbindin D	149	C-peptide	209	Fetuin A	269	HSPA8
30	IL-36RN	90	Calcitonin	150	Creatinine	210	Fetuin B	270	HTRA2
31	Aldolase A	91	Calreticulin	151	CRP	211	FGFR1	271	IBSP
32	Aldolase B	92	Calsyntenin-1	152	CRTAM	212	FGFR1 alpha	272	IGF2BP1
33	Aldolase C	93	CPN2	153	CSH1	213	FGFR2	273	IGFBP-5
34	ALK	94	CART	154	gamma-Thrombin	214	Fibrinogen	274	IL-23p19
35	Alpha Lactalbumin	95	Caspase-3	155	CutA	215	Fibrinopeptide A	275	IL-33
36	Alpha 1 AG	96	Caspase-8	156	cTnT	216	Fibronectin	276	IL-34
37	A1BG	97	Cathepsin B	157	Cyclin D1	217	Ficolin-3	277	INSRR
38	A1M	98	Cathepsin D	158	Cystatin A	218	FIH	278	Integrin alpha V
39	A2M	99	Cathepsin L	159	Cystatin B	219	FOLR1	279	CD61
40	TPM1	100	Cathepsin S	160	Cystatin C	220	FOXN3	280	Itk
41	ALPP	101	CBP	161	Cytochrome C	221	FoxO1	281	ITM2B
42	pro-MMP13	102	CCK	162	Cytokeratin 8	222	FoxP3	282	Kallikrein 2
43	AMICA	103	CD23	163	Cytokeratin 18	223	FRK	283	ApoC3
44	AMPKa1	104	CD24	164	Cytokeratin 19	224	FSH	284	Kallikrein 5
45	Amylin	105	CD36	165	DBI	225	Furin	285	Kallikrein 6
46	ANGPTL3	106	CD38	166	DCBLD2	226	Fyn	286	Positive-1b
47	ANGPTL4	107	CD44	167	D-Dimer	227	GADD45A	287	Positive-2b
48	Annexin A7	108	CD45	168	DEFA1/3	228	Galectin-1	288	Positive-3b
49	APC	109	CD46	169	Defensin	229	Galectin-3BP	289	neg
50	APCS	110	CD47	170	Desmin	230	Galectin-7	290	Kallikrein 7
51	Apelin	111	CD55	171	DLL1	231	Gas1	291	Kallikrein 8
52	Apex1	112	CD59	172	DLL4	232	Gastrin	292	Kallikrein 10
53	APN	113	CD71	173	DMP-1	233	GATA-3	293	Kallikrein 11
54	ApoA1	114	CD74	174	DPPIV	234	GATA-4	294	Kallikrein 14
55	ApoA2	115	CD90	175	BNP	235	Gelsolin	295	KCC3
56	ApoA4	116	CD97	176	E-Cadherin	236	Ghrelin	296	KCTD10
57	ApoB	117	CD 79 alpha	177	Endorphin Beta	237	GLP-1	297	KIF3B
58	ApoC2	118	CD200	178	Endothelin Receptor A	238	GPI	298	KLF4
59	ApoB100	119	CEA	179	Enolase 2	239	GPBB	299	LAG-3
60	ApoE	120	CEACAM-1	180	ENPP2	240	GMNN	300	pro-Glucagon

# RayBio® Human Glycosylation Antibody Array L-493 Target List

...continued

Number	Name	Number	Name	Number	Name	Number	Name
301	Layilin	361	Pappalysin-1	421	S100A4	481	TRPC6
302	LDL R	362	Pancreatic Polypeptide	422	S100A6	482	TRPM7
303	Legumain	363	Presenilin 1	423	S100A8	483	Trypsin 1
304	LH	364	PARK7	424	S-100b	484	TSH
305	LIMPII	365	Visfatin	425	SART1	485	TSLP
306	LIN41	366	P-Cadherin	426	SART3	486	TXK
307	Livin	367	PCAF	427	SCG3	487	Uromodulin
308	LOX-1	368	PD-1	428	Selenoprotein P	488	TFF1
309	LPS	369	PTH	429	SEMA3A	489	VDUP-1
310	LRG1	370	Troponin C	430	Serotonin	490	VEGF R1
311	LTF	371	PDX-1	431	Serpin A1	491	VEGF
312	LTK	372	PEDF	432	Serpin A12	492	VIP Receptor 2
313	Lumican	373	PEPSINOGEN I	433	Serpin A3	493	Vitamin D Receptor
314	Lyn	374	PEPSINOGEN II	434	Serpin A4	494	Vitamin D-BP
315	LYRIC	375	Vasopressin	435	Serpin A5	495	Vitamin K-dependent protein S
316	LYVE-1	376	PGRP-S	436	Serpin A8	496	Vitronectin
317	LZTS1	377	PI 16	437	Serpin A9	497	VWF
318	Mammaglobin A	378	PI 3Kinase p85 beta	438	Serpin B5	498	Wilms Tumor 1
319	Marapsin	379	PIM2	439	Serpin D1	499	XIAP
320	MATK	380	PKM2	440	Serpin I1	500	ZAG
321	MBL	381	Plasminogen	441	SERPING1	501	ZAP70
322	MBL-2	382	Podocalyxin	442	SERTAD2	502	Neg
323	Mer	383	POMC	443	SHBG	503	Neg
324	Mesothelin	384	PON1	444	SMAC	504	Neg
325	MICB	385	PON2	445	SNCG	505	Neg
326	Midkine	386	PPARG2	446	SSTR5	506	Neg
327	MINA	387	PPP2R5C	447	Somatotropin	507	Neg
328	FABP3	388	NR3C3	448	SOST	508	Positive-3c
329	MSHa	389	INSL3	449	SOX17	509	Positive-2c
330	MTUS1	390	Pro-BDNF	450	SOX2	510	Positive-1c
331	Myoglobin	391	Procalcitonin	451	SPARCL1		
332	NAIP	392	Pro-Cathepsin B	452	SPINK1		
333	Nanog	393	Thrombin	453	SRMS		
334	NELL2	394	Prohibitin	454	SSEA-1		
335	NEP	395	ProSAAS	455	SSEA-4		
336	Galanin	396	Prostasin	456	SSTR2		
337	Nesfatin	397	PSP	457	Survivin		
338	Nestin	398	Pro-MMP-7	458	SYK		
339	NET1	399	Pro-MMP-9	459	Syndecan-1		
340	Netrin G2	400	Protein p65	460	Syndecan-3		
341	Netrin-4	401	PSA-Free	461	TACE		
342	Neuropeptide Y	402	PSA-total	462	TAF4		
343	NF1	403	PTHLP	463	Tyk2		
344	NM23-H1/H2	404	PTN	464	Tec		
345	Presenilin 2	405	PTPRD	465	TFF3		
346	Notch-1	406	PYK2	466	Thrombomodulin		
347	NPTX1	407	PYY	467	Thymidine Kinase-1		
348	NPTXR	408	Ras	468	Thyroglobulin		
349	Progesterone	409	RBP4	469	TIM-1		
350	Ntn1	410	RECK	470	TNK1		
351	OCT3/4	411	RELM alpha	471	TOPORS		
352	Omentin	412	Resistin	472	TPA		
353	Osteocalcin	413	RET	473	TRA-1-60		
354	Osteopontin	414	RIP1	474	TRA-1-81		
355	OX40	415	ROCK1	475	Transferrin		
356	p21	416	ROCK2	476	Trappin-2		
357	p27	417	ROR1	477	TRKB		
358	p53	418	ROR2	478	TROPONIN I		
359	PAI-1	419	ROS	479	TYRO10		
360	PAK7	420	RYK	480	TRPC1		

## E. RayBio® Human Glycosylation Antibody Array L-3 Map

1	P 1a	P 1a	P 2a	P 2a	P 3a	P 3a	neg	neg	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	
2	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30	30	
3	31	31	32	32	33	33	34	34	35	35	36	36	37	37	38	38	39	39	40	40	41	41	42	42	43	43	44	44	45	45	
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20	P 1b	P 1b	P 2b	P 2b	P 3b	P 3b	neg	neg	290	290	291	291	292	292	293	293	294	294	295	295	296	296	297	297	298	298	299	299	300	300	
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22	316	316	317	317	318	318	319	319	320	320	321	321	322	322	323	323	324	324	325	325	326	326	327	327	328	328	329	329	330	330	
23	331	331	332	332	333	333	334	334	335	335	336	336	337	337	338	338	339	339	340	340	341	341	342	342	343	343	344	344	345	345	
24	346	346	347	347	348	348	349	349	350	350	351	351	352	352	353	353	354	354	355	355	356	356	357	357	358	358	359	359	360	360	
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35	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	positi	positi	positi	positi	positi	positi

# F. RayBio® Human Glycosylation Antibody Array L-3 Target List

number	name	number	name	number	name	number	name	number	name
1	Pos 1a	61	alpha Tubulin	121	beta 1 Spectrin	181	Cathepsin X/Z/P	241	Collagen I a1
2	Pos 2a	62	AlphaA Crystallin/CRYAA	122	beta B1 Crystallin/CRYBB1	182	CBS	242	Collagen III
3	Pos 3a	63	ALS	123	beta -I Tubulin	183	CCDC126	243	Collagen IVa6
4	Neg	64	Als2	124	beta III Tubulin/CUBB3	184	CCDC25	244	Collagen IX
5	14-3-3 beta	65	ALS+B62:B1212CR1	125	BID	185	CCT3	245	Collagen V
6	14-3-3 epsilon	66	Aminoacylase	126	BIN2	186	CD109	246	Collagen VI
7	14-3-3 eta	67	Androgen Receptor	127	BIRC6	187	CD133	247	Collagen X
8	14-3-3 gamma	68	ANGPTL6	128	BLMH	188	CD155	248	Collagen XV alpha 1
9	14-3-3 sigma	69	ANGPTL8	129	BLVRB	189	CD157	249	COMP
10	14-3-3 theta	70	ANK	130	BMP-1	190	CD16	250	Complement Factor B
11	14-3-3 zeta	71	Ankrd26	131	BPGM	191	CD21	251	Contactin-3
12	53BP1	72	Annexin A1	132	BPIFB1	192	CD32	252	COPS8
13	67LR	73	Annexin A2	133	BPIL1	193	CD35	253	Corneodesmosin
14	ABAT	74	Annexin A6	134	BRCA 2	194	CD39L4	254	Coronin 3
15	ABCF1	75	Annexin V	135	BRD2	195	CD41	255	Cortactin
16	ABI3BP	76	ANP	136	Brevican	196	CD42b	256	COTL1
17	ACAA1	77	Anti-thrombin III	137	Brg1	197	CD48	257	CPE
18	ACAA2	78	APA	138	BRSK1	198	CD5L	258	CPEB3
19	ACACA	79	APLP-1	139	BTD	199	CD9	259	CPM
20	Acetyl-CoA acetyltransferase/ACAA	80	APM2	140	BTF3	200	CD98	260	CPN1
21	ACLP	81	Apo (a)	141	C 1q	201	CDA	261	CPNE3
22	ACLY	82	APOA1BP	142	C 1q S	202	CDC5L	262	CPS1
23	Aconitase 1	83	Apolipoprotein F	143	C1QB	203	CDK2	263	Creatine Kinase MM/CKMM
24	ACTBL2	84	Apolipoprotein L 1	144	C1qR1	204	CEACAM-8/CD66b	264	CRF21
25	ACTC1	85	Apolipoprotein L 2	145	C1RL	205	CECR1	265	CRHBP
26	Actinin alpha 1	86	ARFBP1	146	C1s	206	CENPF	266	Crkl
27	ADAMDEC1	87	ARFGEF3	147	C3orf75	207	CEP57	267	CRMP2
28	ADAS	88	Argininosuccinate Lyase/ASL	148	C4.4A	208	CES1	268	CRTAC1
29	ADH1B	89	ArgRS	149	C4BPA	209	CETP	269	CS
30	ADH1C	90	ARP19	150	C5b-9	210	Cezanne	270	Ctip2
31	ADH4	91	Arp2	151	C6 -N-t	211	CFHR 1	271	Cux2
32	ADH5	92	ARP2/3	152	C8G	212	CFHR4	272	Cyclophilin A
33	ADM	93	Arp3	153	C9orf40	213	CFHR5	273	Cyclophilin B
34	Advillin-N-t	94	ARPC2	154	CA1	214	CFI	274	Cystatin D
35	AFG3L2	95	ARPC3	155	CA150	215	CFL1	275	Cystatin E/M
36	AGA	96	ART3	156	CA2	216	CFVII	276	Cystatin S
37	Aggrecan	97	ARTS1	157	CA3	217	CHC17	277	Cystatin SN
38	AGXT	98	ARX	158	CACNB4	218	Chitobiase	278	Cysteine-rich Protein 1
39	AHNAK	99	ASH2L	159	CAD	219	Chitotriosidase	279	CYTL1
40	Ahsp	100	ASGR2	160	Cadherin 22	220	CHORDC1	280	Cytochrome b5
41	AIF	101	ASK1	161	Cadherin-6	221	CHREBP	281	Cytochrome c
42	AK2	102	Aspartate Aminotransferase /AST	162	Caldesmon/CALD1	222	Chromogranin B	282	Cytokeratin 1
43	AKAP9	103	Aspartyl Aminopeptidase/DNPEP	163	CALML5	223	Chromogranin C	283	Cytokeratin 10
44	AKR1B1	104	ASXL1	164	Calmodulin	224	CIP29	284	Cytokeratin 13
45	AKR1C3	105	ATBF1/ZFXH3	165	Calpain 1	225	CKB	285	Cytokeratin 14
46	AKR7A2	106	ATP5A	166	Calpain S1	226	CUC1	286	Pos 1b
47	ALAD	107	ATP5O	167	Calpastatin	227	CUC4	287	Pos 2b
48	Alanine Transaminase/ALT	108	ATPB	168	Calretinin	228	CLIP170-N-t	288	Pos 3b
49	Alcohol Dehydrogenase/ADH	109	B3GNT2	169	Calumenin	229	CL-P1	289	Neg
50	Aldehyde Oxidase 1/AOX1	110	B4GalT1	170	CAP1	230	CLPS	290	Cytokeratin 15
51	ALDH16A1	111	B7-H2	171	CapG	231	CLTA	291	Cytokeratin 16
52	ALDH1A1	112	B7-H3	172	CAPZA1	232	CNN2	292	Cytokeratin 17
53	ALDH9A1	113	BAD	173	Carboxypeptidase B2/CPB2	233	CNOT1	293	Cytokeratin 20
54	ALKP	114	Band 3	174	CARHSP1	234	CO4A2	294	Cytokeratin 3
55	ALP	115	BASP1	175	Caspase-14	235	COG4	295	Cytokeratin 4
56	alpha 1,2 Mannosidase IA	116	Bassoon	176	Catalase	236	COL19A1	296	Cytokeratin 5
57	alpha Actinin 4	117	BAZ2B	177	Cathelicidin	237	COL4A3	297	Cytokeratin 9
58	Alpha Fodrin	118	BCHE	178	Cathepsin A	238	Col6A2	298	D4 GDI
59	alpha Glucosidase II	119	Bcl-w	179	Cathepsin G	239	COL9A3	299	DAK
60	alpha -Synuclein	120	BCOR	180	Cathepsin H	240	COLEC10	300	DAN

# F. RayBio® Human Glycosylation Antibody Array L-3 Target List...continued

number	name	number	name	number	name	number	name
301	DARS2	361	ERAB	421	GCLC	481	Histone H2B K
302	DCI	362	ERAP2	422	GCSH	482	Histone H3.3
303	DCXR	363	ERp29	423	GDA	483	Histone H4
304	DDAH1	364	Erp57	424	GDF7	484	HLA-C
305	DDT	365	Erp72	425	GDI1	485	HMGB1
306	DDX3Y	366	ESD	426	GDI2	486	HMGB2
307	DEFA6	367	ESR1	427	Gephyrin	487	HMGB3
308	DEP-1	368	ETL	428	GFAP	488	HMGN2
309	Der p2	369	EVC2	429	GHRF	489	HN1
310	Dermcidin	370	Ezrin	430	GIP	490	HNF-3 alpha /FoxA1
311	Desmocollin 1	371	F11	431	GLIPR2	491	hnRNP A1
312	Desmocollin-2	372	FABP5	432	GLRX1	492	hnRNP A2B1
313	Desmocollin-3	373	Factor IX	433	G6PD	493	hnRNP C1 + C2
314	Desmoglein-1	374	Factor V	434	Glucosidase 2 subunit beta/PRKCSH	494	hnRNP G
315	Desmoglein-2	375	Factor XII	435	GLUD1	495	hnRNP L
316	Desmoplakin	376	Factor XIII	436	Glutamyl hydrolase gamma /CGH	496	hnRNP M1-M4
317	Desmuslin	377	FAM20C	437	glutathione S transferase Omega 1/GSTO1	497	hnRNP U
318	Destrin	378	FAM3C	438	Glutathione Synthetase/GSS	498	Hornerin
319	DGK	379	Fascin	439	Glycerol 3 Phosphate Dehydrogenase	499	Hoxb3
320	DISC 1	380	FASN	440	Glycoprotein V	500	HOXD11
321	DMGDH	381	fast skeletal Myosin	441	Glyoxalase II	501	HP1BP3
322	DMRN9	382	FASTKD5	442	GM2A	502	HPD
323	Dopamine beta Hydroxylase/DBH	383	FBP 38	443	GMF beta	503	HPR
324	DOT1L	384	FBP2	444	GNB1	504	HPRT
325	DPEP2	385	FBPase 1	445	GNPTG	505	HRG
326	DPP3	386	FCGBP	446	GOLPH2	506	HRSP12
327	DPP1	387	FDPS	447	GOLPH4	507	HSC70
328	DRIL1	388	FH	448	GOT2	508	HSP47
329	DSCAM	389	Fibrillin 1	449	GPCR GPR116	509	Neg
330	DSPG3	390	Fibrinogen gamma chain/FGG	450	GPLD1	510	Neg
331	Dystroglycan	391	Fibrinogen-like 2	451	Grainyhead-like protein 1 homolog/GRHL1	511	Neg
332	E1 Ubiquitin Activating Enzyme/UBA1	392	Fibrinopeptide B	452	Granzyme M	512	Neg
333	ECHS1	393	Fibulin 3	453	GRHPR	513	Neg
334	ECM-1	394	Ficolin-2	454	GRP	514	Neg
335	EEF1G	395	Filamin A	455	GSTM1	515	Neg
336	EEF2	396	Filamin B	456	GSTP1	516	Neg
337	EFEMP2	397	Filamin C	457	Guanylin	517	Neg
338	EFTUD2	398	FKBP12	458	GULP1/CED-6	518	Neg
339	EHD1	399	FKBP25	459	H6PD	519	Neg
340	EHD3	400	FKBP51	460	HABP2	520	Neg
341	EIF3S2	401	FLG2	461	HBZ	521	Neg
342	eIF4A1-N-t	402	FOLR3	462	HCFC1	522	Neg
343	eIF5A	403	Frizzled 8	463	HDGF	523	Pos 1c
344	ELAVL1	404	FRY	464	HEG1	524	Pos 2c
345	EMILIN1	405	FSH	465	Hemoglobin	525	Pos 3c
346	EMSY	406	FTL	466	Hemoglobin A1c	526	
347	EN2	407	FUCA1	467	Hemoglobin subunit beta/HBB	527	
348	Endorepellin	408	FUCA2	468	Hemoglobin subunit delta/HBD	528	
349	ENO1	409	Fumarylacetoacetate hydrolase/FAH	469	Hemoglobin subunit gamma 2/HBG2	529	
350	ENO1 + ENO2 + ENO3	410	G0/G1switch 2	470	HEXB	530	
351	ENSA	411	G3BP	471	HGFA	531	
352	Envoplakin	412	GALNT2	472	hGH	532	
353	Eosinophil derived neurotoxin/EDN	413	gamma Catenin	473	hHR23b	533	
354	EPB41	414	GAPDH	474	HIBADH	534	
355	EPCR	415	GARNL1	475	HINT1	535	
356	Ephrin B1	416	GART	476	HIP1R	536	
357	Ephrin B2	417	Gastroke 1	477	Histone H1.2	537	
358	EPHX2	418	GATM - C-terminal	478	Histone H1.3	538	
359	EPPK1	419	GBE1	479	Histone H2A	539	
360	Eps 15	420	GCDFP 15	480	Histone H2A.Z	540	

## G. RayBio® Human Glycosylation Antibody Array L-4 Map

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	P 1a	P 1a	P 2a	P 2a	P 3a	P 3a	neg	neg	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15
2	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30	30
3	31	31	32	32	33	33	34	34	35	35	36	36	37	37	38	38	39	39	40	40	41	41	42	42	43	43	44	44	45	45
4	46	46	47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60
5	61	61	62	62	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75
6	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	85	85	86	86	87	87	88	88	89	89	90	90
7	91	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100	100	101	101	102	102	103	103	104	104	105	105
8	106	106	107	107	108	108	109	109	110	110	111	111	112	112	113	113	114	114	115	115	116	116	117	117	118	118	119	119	120	120
9	121	121	122	122	123	123	124	124	125	125	126	126	127	127	128	128	129	129	130	130	131	131	132	132	133	133	134	134	135	135
10	136	136	137	137	138	138	139	139	140	140	141	141	142	142	143	143	144	144	145	145	146	146	147	147	148	148	149	149	150	150
11	151	151	152	152	153	153	154	154	155	155	156	156	157	157	158	158	159	159	160	160	161	161	162	162	163	163	164	164	165	165
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19	271	271	272	272	273	273	274	274	275	275	276	276	277	277	278	278	279	279	280	280	281	281	282	282	283	283	284	284	285	285
20	P 1b	P 1b	P 2b	P 2b	P 3b	P 3b	neg	neg	290	290	291	291	292	292	293	293	294	294	295	295	296	296	297	297	298	298	299	299	300	300
21	301	301	302	302	303	303	304	304	305	305	306	306	307	307	308	308	309	309	310	310	311	311	312	312	313	313	314	314	315	315
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34	496	496	497	497	498	498	499	499	500	500	501	501	502	502	503	503	504	504	505	505	506	506	507	507	508	508	neg	neg	neg	neg
35	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	neg	positi	positi	positi	positi	positi



## H. RayBio® Human Glycosylation Antibody Array L-4 Target List

number	name	number	name	number	name	number	name	number	name
1	Pos 1a	61	Laminin 2 alpha	121	MN1	181	Orosomucoid 2	241	Plakophilin 1
2	Pos 2a	62	Laminin b2	122	Moesin	182	ORP150	242	Plastin L
3	Pos 3a	63	Laminin gamma 1	123	MP1	183	OSBP1	243	PLC-gamma 1
4	Neg	64	LAMP	124	MPCA	184	OSCAR	244	Pleckstrin
5	HSPA1A	65	LAMP1	125	MPO	185	OSM R beta	245	Plectin
6	HTRA1	66	LAMP2	126	MRP 1	186	Osteoadherin(2)	246	Plexin B1
7	Human Agrin	67	LAP3	127	MSH6	187	Oxytocin-neurophysin 1/OXT	247	Plexin B2
8	IBP160	68	LASP1	128	mTOR	188	p16 ARC	248	PLOD1
9	IDH1	69	Latent TGF beta bp2	129	MUCDHL	189	P20Sb3	249	PLOD2
10	IDH3A	70	LCAT	130	Multimerin 2	190	p23	250	PLS3
11	IFRD1	71	LCMT2	131	MyBPC3	191	p39	251	Plxdc2
12	IGF2BP2	72	LDHA	132	MYH2	192	P4HB	252	PNP
13	IGFBP7	73	LDHB	133	MYH6	193	p73	253	POR
14	IGSF4B	74	LEDGF	134	MYH7	194	PA2G4	254	PPCS
15	Ihh	75	LEKTI/SPINK5	135	MYHC	195	PABP	255	PPOX
16	ILK	76	LILRA3	136	MYL12B	196	PACS1	256	PPP2R1B
17	Inhibin beta	77	LIMS1	137	MYL3	197	PARVB	257	PPP2R4
18	Integrin b1	78	LMAN2	138	MYO5A	198	PCBP1	258	PRCP
19	Integrin beta 6	79	LMW-PTP/ACP1	139	Myoferlin	199	PCBP2	259	PRDM13
20	Integrin a6	80	LOK	140	Myosin 18B	200	PCCA	260	PRDX 1
21	IQGAP1	81	LOX	141	Myotrophin	201	PCDH7	261	PRELP
22	IQGAP2	82	LOXL1	142	NABC1	202	PCDX8	262	PREP
23	IRE1	83	LRP 4	143	NAGLU	203	PCK2	263	PRG2
24	IRS2	84	LTA4H	144	NAP1L1	204	PCMT1	264	Prion protein PrP /PRNP
25	ISOC2	85	LTBP4	145	NAPRT1	205	PCNA	265	Profilin 1
26	ITGB4BP	86	Lubricin	146	NASP	206	PCPE-1	266	Properdin
27	ITIH1	87	LUZP1	147	NCAM2	207	PCSK9	267	Prosaposin
28	ITIH2	88	LYPEA1	148	Nebulin	208	PCYOX1	268	Prostaglandin D Synthase/PTGDS
29	ITIH3	89	Lysozyme	149	Nectin-1	209	PDE1B	269	Proteasome 20S a+b
30	ITIH4 a	90	MAGI2	150	Nectin-3	210	PDIA6	270	Proteasome 20S alpha
31	JAM-A	91	MAGP-2	151	NEDD8	211	PDLIM1	271	Proteasome 20S alpha 5
32	JARID2	92	MAN1	152	Neogenin	212	PDLIM5	272	Proteasome 20S b7
33	Karyopherin beta 1	93	MANF	153	Nesprin2	213	PDZD2	273	Proteasome 26S S5
34	Keratin 36	94	Mannosidase II	154	Neurabin 1	214	PEBP4	274	Proteasome beta 1
35	Keratin 38	95	MAP1A	155	Neural Cadherin	215	PEPD	275	Proteasome subunit alpha 6/PSMA6
36	KHSRP	96	MAPRE1	156	Neurofibromin	216	PER1	276	Proteasome subunit beta 2/PSB2
37	KIAA0319L	97	MARCKS	157	Neurogranin	217	perilipin 3	277	Proteasome subunit beta 4/PSB4
38	KIAA1468	98	MASP3	158	Neuropeptide B	218	Perilipin-1	278	Protein C
39	KIAA1967	99	MBD2	159	Neuropilin-1	219	Periostin	279	Protein Z
40	KIF5B	100	MBP	160	Neurotrimin	220	Peroxioredoxin 2	280	Prouroguanylin
41	Kilon	101	MCAM	161	NF-M	221	Peroxioredoxin 3	281	PRSS23
42	KLK-B1	102	Mcl-1	162	Nidogen-2	222	Peroxioredoxin 5	282	PRSS3
43	KMD4B	103	MCM	163	NIT2	223	PF4V1	283	PRTN3
44	KMT2B	104	MCMS5	164	NME3	224	PGAM1	284	PSMA1
45	KRT31	105	MCMP2	165	nNOS	225	PGAM2	285	PSMA2
46	KRT72	106	MDH1	166	Noelin	226	PGD	286	Pos 1b
47	Krt73	107	MDH2	167	Non-muscle Actin/Actin	227	PGDF/PHGDH	287	Pos 2b
48	KRT82	108	ME1	168	non-muscle Myosin IIA/Myosin	228	PGK-1	288	Pos 3b
49	KRT85 - N-terminal	109	MEP1A	169	Notch-2	229	PGLS-C-t	289	Neg
50	KRTDAP	110	Metallothionein	170	Notch-2 ICD	230	PGM1	290	PSMA4
51	KRTHA3B	111	Metavinculin	171	NPAS3	231	PGRPL	291	PSMA7
52	KSR1	112	MFAP4	172	NPM1	232	PHAP1	292	PSMB5
53	LAD	113	MFI2	173	NQO2	233	PSAT1	293	PSMC3
54	LAF4	114	mGLUR5	174	NT5C3	234	PI 3-Kinase C2 beta	294	PSMD1
55	LAI1	115	MGP	175	Nucleobindin 1/NUCB1	235	plgR	295	PSMD9
56	LAM b1	116	Mimecan	176	NUP98	236	PIK3IP1	296	PTEN
57	LAMA	117	MINPP1	177	OBCAM	237	PIN	297	PTK 7
58	Lamin A + C	118	MLCK	178	OIT3	238	PISD	298	PTMA
59	Lamin B1	119	MMR	179	Olfactomedin-2	239	PKLR	299	PTP gamma
60	Lamin B2	120	MMRN1	180	OTC	240	PLA2G1B	300	PTP kappa

# H. RayBio® Human Glycosylation Antibody Array L-4 Target List

...continued

number	name	number	name	number	name	number	name
301	PTP mu	361	SDNSF	421	SUMO3	481	URB
302	PTPRS	362	SDPR	422	Symplekin	482	URB2
303	PTPRZ	363	Secretogranin V/SCG5	423	SynCAM	483	UROC1
304	PYGL	364	Semaphorin 6B	424	Syntaxin 7	484	UROD
305	PZP	365	Semaphorin 7A	425	TAB182	485	URP2
306	QDPR	366	Semenogelin I/SEMG1	426	TAGLN2	486	USP14
307	QPRT	367	Semenogelin II/SEMG2	427	Talin1	487	USP5
308	Quiescin Q6	368	Serpin A11	428	Talin1&2	488	Uteroglobin(1)
309	Rab7a	369	Serpin A7	429	TAX1BP3	489	Utrophin
310	Ran	370	Serpin B3/SCCA1	430	TBCA	490	VAP-1
311	RanGAP1	371	Serpin B6	431	TCEB2	491	VAP-A
312	RAP1AB	372	Serpin B8	432	Tcf20	492	VCP
313	Rbm15	373	Serpin F2	433	TCN1	493	VDAC1 / Porin
314	RCL	374	Serpin A10/ZPI	434	TCP1 eta	494	Versican isoform V0
315	Reg1A	375	SERPINB1	435	Tenascin C	495	Vimentin B
316	Reg3A	376	SerpinB4	436	Tenascin X(1)	496	VNN1
317	RHOC	377	SerpinE2	437	TFF2(1)	497	VSIG4
318	RhoGDI	378	SerRS	438	TGM3	498	WDR1
319	Ribonuclease A	379	SET	439	Thioredoxin-1	499	WISP2
320	Ribonuclease Inhibitor	380	SEZ6L2	440	THOP1	500	WNK2
321	Ribonuclease T2	381	SF20	441	Thymosin b10	501	YB1
322	RKIP	382	SH3BGRL	442	Titin	502	YY1
323	RNA Polymerase II/POLR2A	383	SH3BGRL3	443	TLS/FUS	503	ZBTB4
324	RNASE4	384	SHANK1	444	TMEM223	504	ZC3H4-N-t
325	RNASE6	385	SHC1	445	TOB2	505	ZC3H8
326	RPL10	386	SHIP	446	TOP2B	506	ZDHHC18
327	RPL10A	387	SHMT1	447	TPM4	507	ZNF671
328	RPL11	388	SHP-1	448	TPP1	508	Zyxin
329	RPL12	389	Siglec-1	449	Transaldolase 1/TALDO1	509	Neg
330	RPL14	390	SIGLEC14	450	Transketolase/TALDO	510	Neg
331	RPL17	391	SIM2	451	Transthyretin	511	Neg
332	RPL22	392	SIRP beta 1/CD172b	452	TRAP1	512	Neg
333	RPL5	393	SiX3	453	TRAP220	513	Neg
334	RPL7A	394	SLC38A10	454	TRF 2	514	Neg
335	RPLP0	395	SLITRK1	455	Triosephosphate isomerase/TPIS	515	Neg
336	RPS10	396	SLURP1	456	Tropomyosin 3	516	Neg
337	RPS11	397	SMA	457	TRP-1	517	Neg
338	RPS12	398	SMC4	458	TRPS1	518	Neg
339	RPS19	399	SMPD4	459	Trypsinogeb-2	519	Neg
340	RPS2	400	SOD1	460	TrypsinPan	520	Neg
341	RPS20	401	SOD2	461	Tryptophanyl	521	Neg
342	RPS23	402	SOD-3	462	TSR2	522	Neg
343	RPS25	403	SOD4	463	TUBA6	523	Pos 1c
344	RPS28	404	Somatostatin	464	TWF2	524	Pos 2c
345	RPS3	405	SORD	465	TXNDC4	525	Pos 3c
346	RPS5	406	SorLA	466	TXNDC5	526	
347	RREB1	407	SOX4	467	TXNRD2	527	
348	RSU1	408	SP-D	468	UBE2D3	528	
349	S100A1	409	Spectrin beta-5	469	Ube2L3	529	
350	S100A11	410	SPEN	470	UBE2N/Ubc13	530	
351	S100A7	411	SPINK7	471	Ubiquitin	531	
352	S100A9	412	SPTBN1	472	UCH-L1	532	
353	S100P	413	Src(1)	473	UFM 1	533	
354	SAA	414	SREC-II	474	UGGT	534	
355	SAA4a	415	STAT3	475	UNC-13 Homolog D	535	
356	Salivary alpha amylase/aAmylase	416	Stathmin 1	476	UNC45A	536	
357	SAMSN1	417	Sterol carrier protein 2/SCP2	477	UNC5H4	537	
358	SBP-1	418	STI1	478	UPB1	538	
359	SBSN	419	STOM	479	UQCRB	539	
360	SDF4	420	SUCLG1	480	UQCRH	540	

## VI. Interpretation of Results:

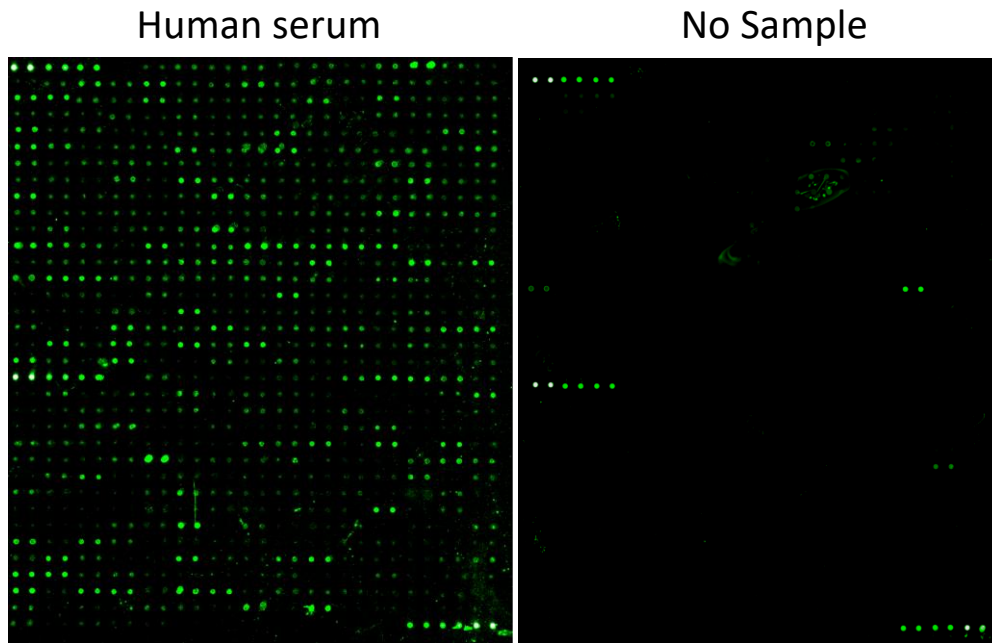
### A. Explanation of Controls Spots

- 1) **Positive Control spots (POS1, POS2, POS3)** are standardized amounts of biotinylated IgGs printed directly onto the array. All other variables being equal, the Positive Control intensities will be the same for each sub-array. This allows for normalization based upon the relative fluorescence signal responses to a known control, much as “housekeeping” genes or proteins are used to normalize results in PCR or Western blots, respectively.
- 2) **Negative Control (NEG) spots** contain a protein-containing buffer (used to dilute antibodies printed on the array). Their signal intensities represent non-specific binding of the Biotin-conjugated lectin mixture and/or the Cy3-Conjugated Streptavidin. Negative control signal intensities are usually very close to background signals in each sub-array.

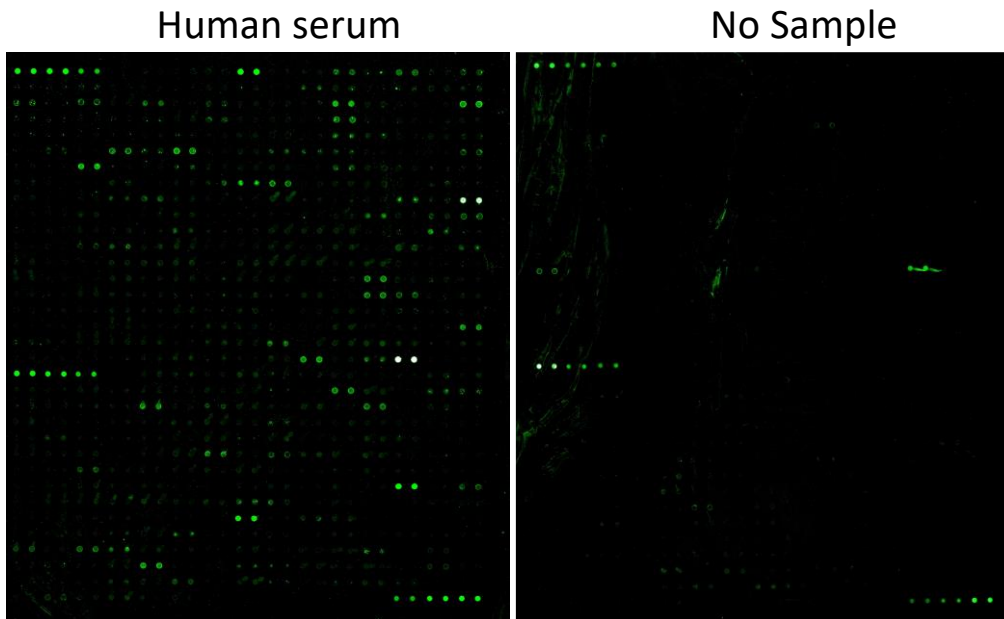
### B. Typical Results

The following figure shows the RayBio® Human Glycosylation Antibody Array 2000 probed with a human serum sample. The images were captured using an Axon GenePix laser scanner. The strong signals in row 20 and the upper left and lower right corners of each array are Positive Controls, which can be used to identify the orientation and help normalize the results between arrays.

## RayBio® Human Glycosylation Antibody Array 507



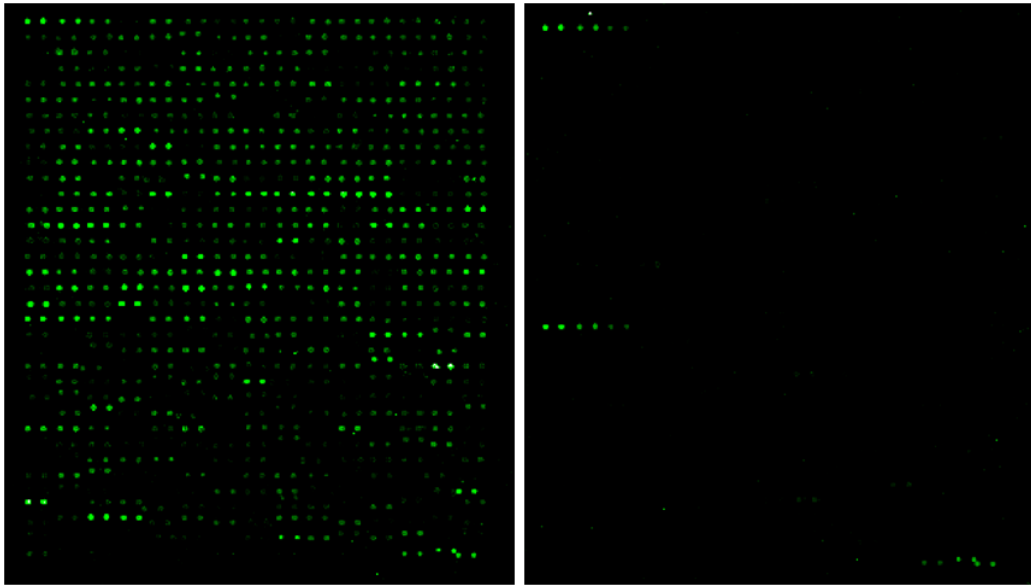
## RayBio® Human Glycosylation Antibody Array 493



## RayBio<sup>®</sup> Human Glycosylation Antibody Array L-3

Conditioned medium

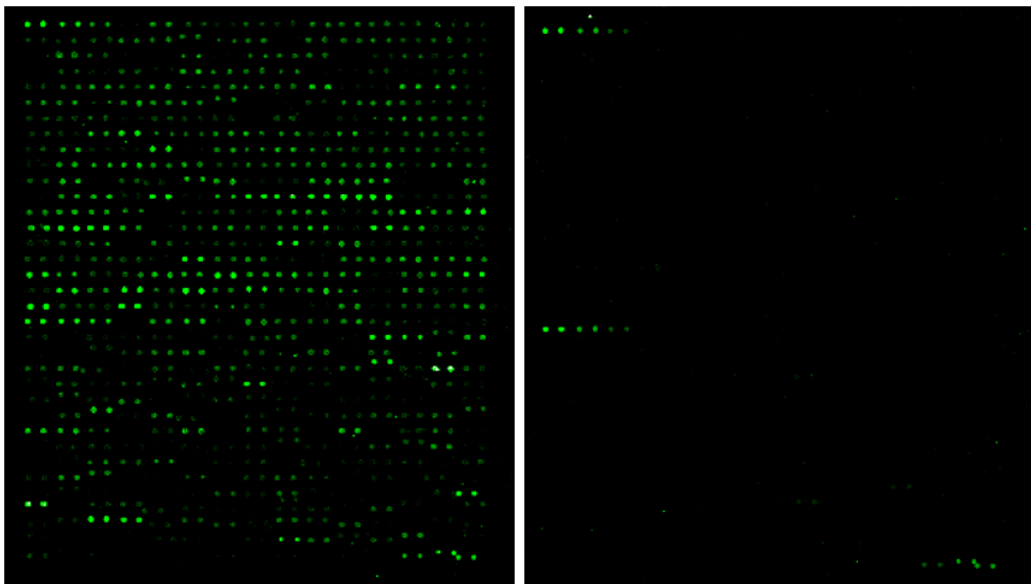
No Sample



## RayBio<sup>®</sup> Human Glycosylation Antibody Array L-4

Conditioned medium

No Sample



RayBio Human Glycosylation Antibody Array 507, 493, L-3, and L-4.  
Probed with biotinylated lectins: (b- Con A; DBA, PNA, UEA I, WGA)

If scanned using optimal settings, 3 distinct signal intensities will be seen: POS1>POS2>POS3. If all of these signals are of similar intensity, try increasing or decreasing laser power and/or signal gain settings.

### **C. Background Subtraction:**

Once you have obtained the fluorescence intensity data, you should subtract the background and normalize to the Positive Control signals before proceeding to analysis.

Most laser fluorescence scanner software has an option to automatically measure the local background around each spot. For best results, we recommend comparing signal intensities representing the MEDIAN background signals minus local background. If your resulting fluorescence signal intensity reports do not include these values (e.g., a column labeled as "MED532-B532"), you may need to subtract the background manually or change the default settings on your scanner's data report menu.

### **D. Normalization of Array Data:**

To normalize signal intensity data, one sub-array is defined as "reference" to which the other arrays are normalized. This choice is arbitrary. For example, in our Analysis Tool Software (described below), the array represented by data entered in the left-most column each worksheet is the default "reference array."

**You can calculate the normalized values as follows:**

$$X(Ny) = X(y) * P1/P(y)$$

**Where:**

**P1 = mean signal intensity of POS spots on reference array**  
**P(y) = mean signal intensity of POS spots on Array "y"**  
**X(y) = mean signal intensity for spot "X" on Array "y"**  
**X(Ny) = normalized signal intensity for spot "X" on Array "y"**

The RayBio® Analysis Tool software is available for use with data obtained using RayBio® Arrays. You can copy and paste your signal intensity data (with and without background) into the Analysis Tool, and it will automatically normalize signal intensities to the Positive Controls.

To order the Analysis Tool, please contact us toll-free at +1-888-494-8555 or [info@raybiotech.com](mailto:info@raybiotech.com) for more information.

### **E. Threshold of significant difference in expression:**

After subtracting background signals and normalization to Positive Controls, comparison of signal intensities between and among array images can be used to determine relative differences in expression levels of each protein between samples or groups.

Any  $\geq 1.5$ -fold increase or  $\leq 0.65$ -fold decrease in signal intensity for a single analyte between samples or groups may be considered a measurable and significant difference in expression, provided that both sets of signals are well above background (Mean background + 2 standard deviations, accuracy  $\approx 95\%$ ).

## VII. Troubleshooting Guide

<b>Problem</b>	<b>Cause</b>	<b>Recommendation</b>
Weak signal	Inadequate detection	Check laser power and PMT parameters
	Inadequate reagent volumes or improper dilution	Check pipettors and ensure correct preparation
	Short incubation times	Ensure sufficient incubation time and change sample incubation step to overnight
	Too low protein concentration in sample	Decrease dilution Or concentrate sample
	Improper storage of kit	Store kit at suggested temperature
High background	Sample is too concentrated	Use more diluted sample
	Excess of streptavidin	Make sure to use the correct amount of streptavidin
	Inadequate detection	Check laser power and PMT parameters
	Inadequate wash	Increase the volume of wash buffer and incubation time
Uneven signal	Bubbles formed during incubation	Avoid bubble formation during incubation
	Arrays are not completely covered by reagent	Completely cover arrays with solution



RayBio® Glycosylation Antibody Arrays are patent-pending technology developed by RayBiotech.

This product is intended for research use only and is not to be used for clinical diagnosis. Our products may not be resold, modified for resale, or used to manufacture commercial products without written approval by RayBiotech, Inc.

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