

## Supplemental information

### **Mucus sialylation determines intestinal host-commensal homeostasis**

**Yikun Yao, Girak Kim, Samantha Shafer, Zuoqia Chen, Satoshi Kubo, Yanlong Ji, Jialie Luo, Weiming Yang, Sebastian P. Perner, Chrysi Kanellopoulou, Ann Y. Park, Ping Jiang, Jian Li, Safa Baris, Elif Karakoc Aydiner, Deniz Ertem, Daniel J. Mulder, Neil Warner, Anne M. Griffiths, Chani Topf-Olivestone, Michal Kori, Lael Werner, Jodie Ouahed, Michael Field, Chengyu Liu, Benjamin Schwarz, Catharine M. Bosio, Sundar Ganesan, Jian Song, Henning Urlaub, Thomas Oellerich, Stacy A. Malaker, Lixin Zheng, Carolyn R. Bertozzi, Yu Zhang, Helen Matthews, Will Montgomery, Han-Yu Shih, Jiansheng Jiang, Marcus Jones, Aris Baras, Alan Shuldiner, Claudia Gonzaga-Jauregui, Scott B. Snapper, Aleixo M. Muise, Dror S. Shouval, Ahmet Ozen, Kuan-Ting Pan, Chuan Wu, and Michael J. Lenardo**

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**Table S1. Clinical Features of ST6GALNAC1-Deficient Patients, related to Figure 4.**

<b>Patient</b>	<b>Pt 1</b>	<b>Pt 2</b>	<b>Pt 3</b>
<b>Age of onset (months)</b>	18	18	3
<b>Current Age (years)</b>	10	9	14
<b>Failure to thrive</b>	Y	Y	Y
<b>Presentation</b>	Recurrent Diarrhea	Recurrent Diarrhea	Oral and perianal inflammation/ulcerations, blood in stool, fever
<b>Endoscopic findings</b>	Aphthous ulcers at the terminal ileum and nodularity in the caecum	Ulcers, edema, fibrin in ileo-cecal region	Superficial ulcer in the esophagus, perianal skin tag and fissures
<b>Imaging findings</b>			Terminal ileitis
<b>Histopathology</b>			
Eosinophil infiltration	Ileum	Esophagus, Ileum, Colon	Stomach
Granulomas	ND	Stomach, Duodenum, Ileum	Mouth
Lymphocytic Infiltration	Colon, Rectum	Duodenum	Esophagus
Goblet cells	Decrease	Decrease	
Cryptitis	Rectum	Ileum	

**Table S2. Clinical hematological and immune parameters, related to Figure 4.**

	Pt. 1	Normal ranges	Pt. 2	Normal ranges	Pt. 3	Normal ranges
<b>Lymphocyte populations</b>						
<b>% (absolute number)</b>						
CD3	62	60-83 (714-2266)	81 (2859)	60-83 (714-2266)	N.D.	60-83 (714-2266)
CD4/CD3%	24	31-62 (359-1565)	43 (1518)	31-62 (359-1565)	N.D.	31-62 (359-1565)
CD4 naïve (CD62L+/CD45RA+)	49	7.6-37 (102-1041)	N.D.	7.6-37 (102-1041)	N.D.	7.6-37 (102-1041)
CD4 Effector memory (CD62L-/CD45RA-)	26	2.3-15.6 (42-225)	N.D.	2.3-15.6 (42-225)	N.D.	2.3-15.6 (42-225)
CD4 Central Memory (CD62L+/CD45RA-)	21	10.4-30.7 (162-614)	N.D.	10.4-30.7 (162-614)	N.D.	10.4-30.7 (162-614)
CD8/CD3%	28	11-35 (178-853)	33 (1165)	11-35 (178-853)	N.D.	11-35 (178-853)
CD8 naïve (CD62L+/CD45RA+)	29	5.7-19.7 (85-568)	N.D.	5.7-19.7 (85-568)	N.D.	5.7-19.7 (85-568)
CD8 Effector memory (CD62L-/CD45RA-)	40	1.1-9.2 (24-175)	N.D.	1.1-9.2 (24-175)	N.D.	1.1-9.2 (24-175)
CD8 Central Memory (CD62L+/CD45RA-)	2	1.5-10.3 (25-180)	N.D.	1.5-10.3 (25-180)	N.D.	1.5-10.3 (25-180)
CD8 TEMRA (CD62L-/CD45RA+)	N.D.	0.7-7.8 (11-172)	N.D.	0.7-7.8 (11-172)	N.D.	0.7-7.8 (11-172)
CD4/CD8 ratio	0.85	1.1-5.17	1.3	1.1-5.17	N.D.	1.1-5.17
αβDNT Cells	N.D.	1.3-9.2(18-185)	N.D.	1.3-9.2(18-185)	N.D.	1.3-9.2(18-185)
CD20	18	3-19% (59-329)	14 (494)	3-19% (59-329)	N.D.	3-19% (59-329)
Memory B cells (CD20 <sup>+</sup> /CD27 <sup>+</sup> )	N.D.	0.8-3.6 (12-68)	N.D.	0.8-3.6 (12-68)	N.D.	0.8-3.6 (12-68)
Plasma Blasts (CD20 <sup>+</sup> /CD38 <sup>+</sup> )	N.D.	1.2-17.6	N.D.	1.2-17.6	N.D.	1.2-17.6
NK	N.D.	6-34% (126-729)	N.D.	6-34% (126-729)	N.D.	6-34% (126-729)
<b>Immunoglobulin levels</b>						
IgG mg/dL	1140	572-1474	1070	670-1530	910	572-1474
IgM mg/dL	114	34-305	158	52-274	160	34-305
IgA mg/dL	69	20-263	79.8	48-179	150	20-263
IgE IU/mL	16	0-90	289	<52	41	0-90
<b>WBC</b> *10 <sup>9</sup> /L	6.6	4.5-11	8.61	5-14.5	19	5.0-12.0
<b>ANC</b> *10 <sup>9</sup> /L	2.9	1.5-8	2.95	1.8-8	N.D.	1.8-8
<b>ALC</b> *10 <sup>9</sup> /L	2.8	1.5-6.5	1.27	1.5-6.5	N.D.	1.5-6.5
<b>eo</b> *10 <sup>9</sup> /L	0.2	(0-0.6)	0.77	(0-0.6)	1	.02-5
<b>Hb</b> g/L	127	121-172	135.5	115-135	118	110-140
<b>Platelets</b> *10 <sup>9</sup> /L	403	130-440	437	130-440	322	150-400
<b>Albumin</b> g/L	47	33.0-46.0	29	33.0-46.0	38.7	33.0-46.0
<b>CRP</b> mg/L	N.D.	<1.0	230	0-8	0.4	<1.0
<b>ESR</b> mm/h	5	<10	65	<10	8	<10
<b>Neutrophil count</b> *10 <sup>9</sup> /L	2.9	1.5-8.5	N.D.	1.5-8.5	12.4	1.5-8.5
<b>Lymphocyte count</b> *10 <sup>9</sup> /L	2.8	2.0-8.0	N.D.	2.0-8.0	4.3	2.0-8.0
<b>ANA</b>	N.D.	negative	1:160	negative	negative	negative
<b>ASCA IgA</b> KEU/L	negative	<20	N.D.	<20	1	<20
<b>ASCA IgG</b> KEU/L	positive	<20	43.5	<20	10	<20
<b>ANCA</b>	negative	negative	negative	negative	negative	negative
<b>Neutrophil oxidative burst index</b>	N.D.	32-300	normal	32-300	303	32-300

**Abbreviations**

TEMRA	Terminally differentiated effector Memory T cells
αβDNT	CD4 and CD8 Double Negative alpha/beta T-cell receptor T cells
NK	Natural Killer cells
WBC	White Blood Cells
ANC	Absolute Neutrophil Count
ALC	Absolute Lymphocyte Count
eo	eosinophil count
Hb	Hemoglobin
CRP	C-Reactive Protein
ESR	Erythrocyte Sedimentation Rate
ANA	Antinuclear Antibodies
ASCA	Anti-Saccharomyces Cerevisiae Antibodies
ANCA	Antineutrophil Cytoplasmic Antibodies
N.D.	Not determined