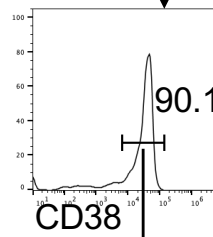
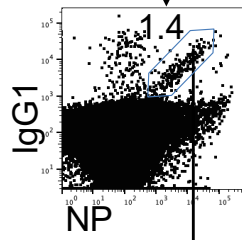
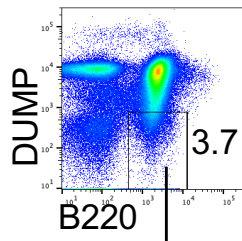
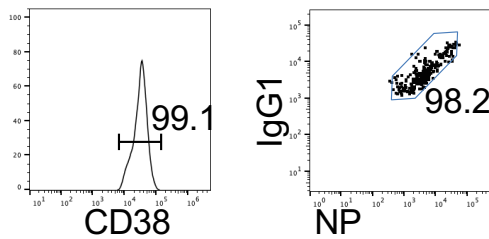
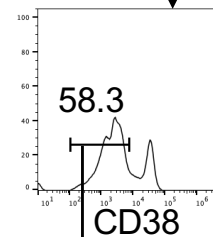
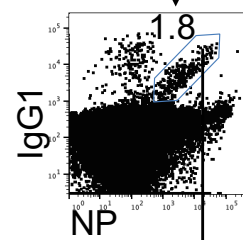
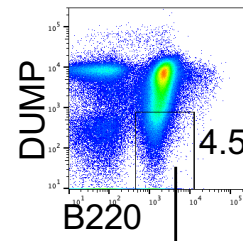
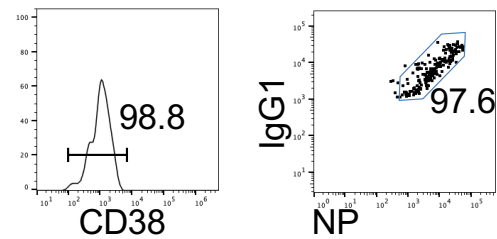


**A**

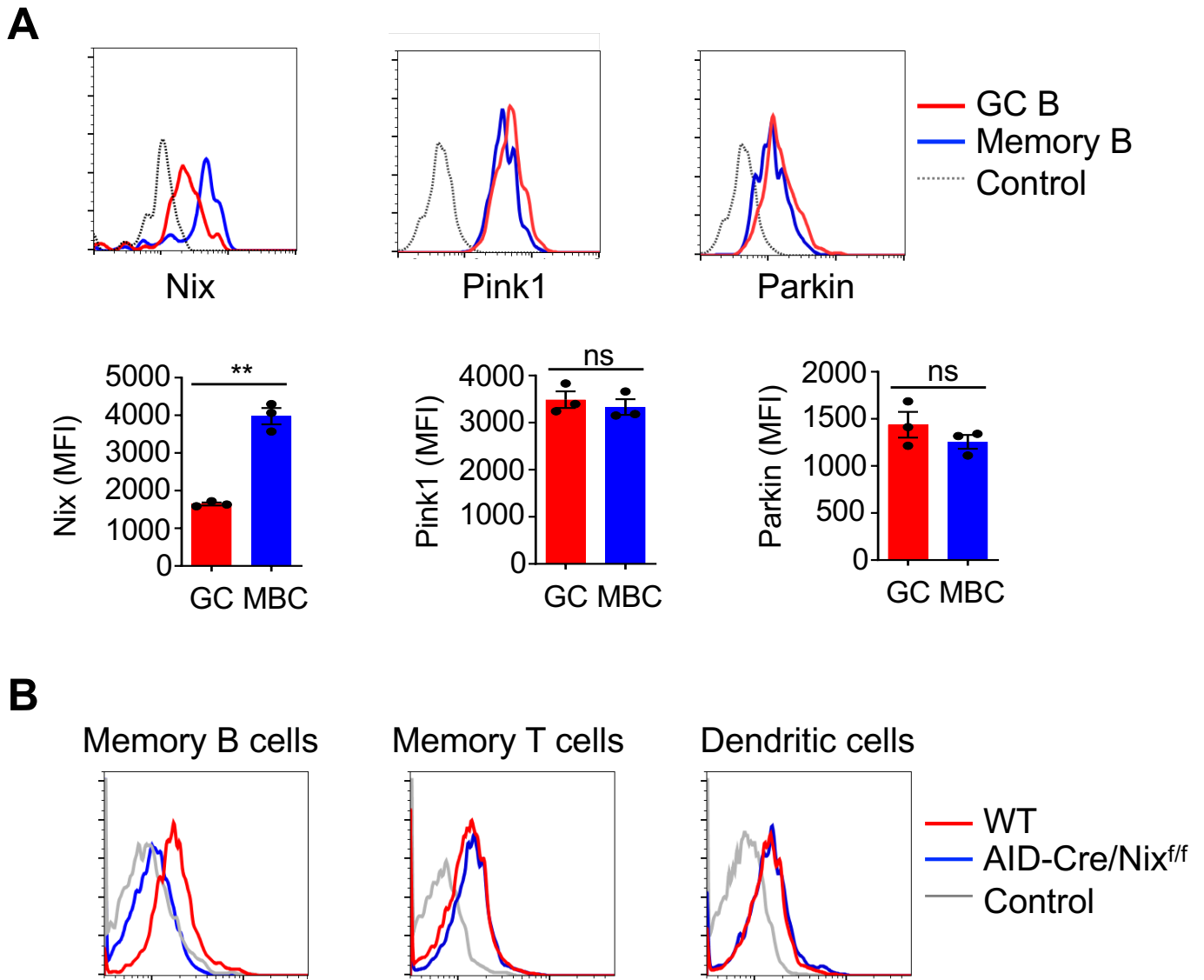
Memory B cells

**B**

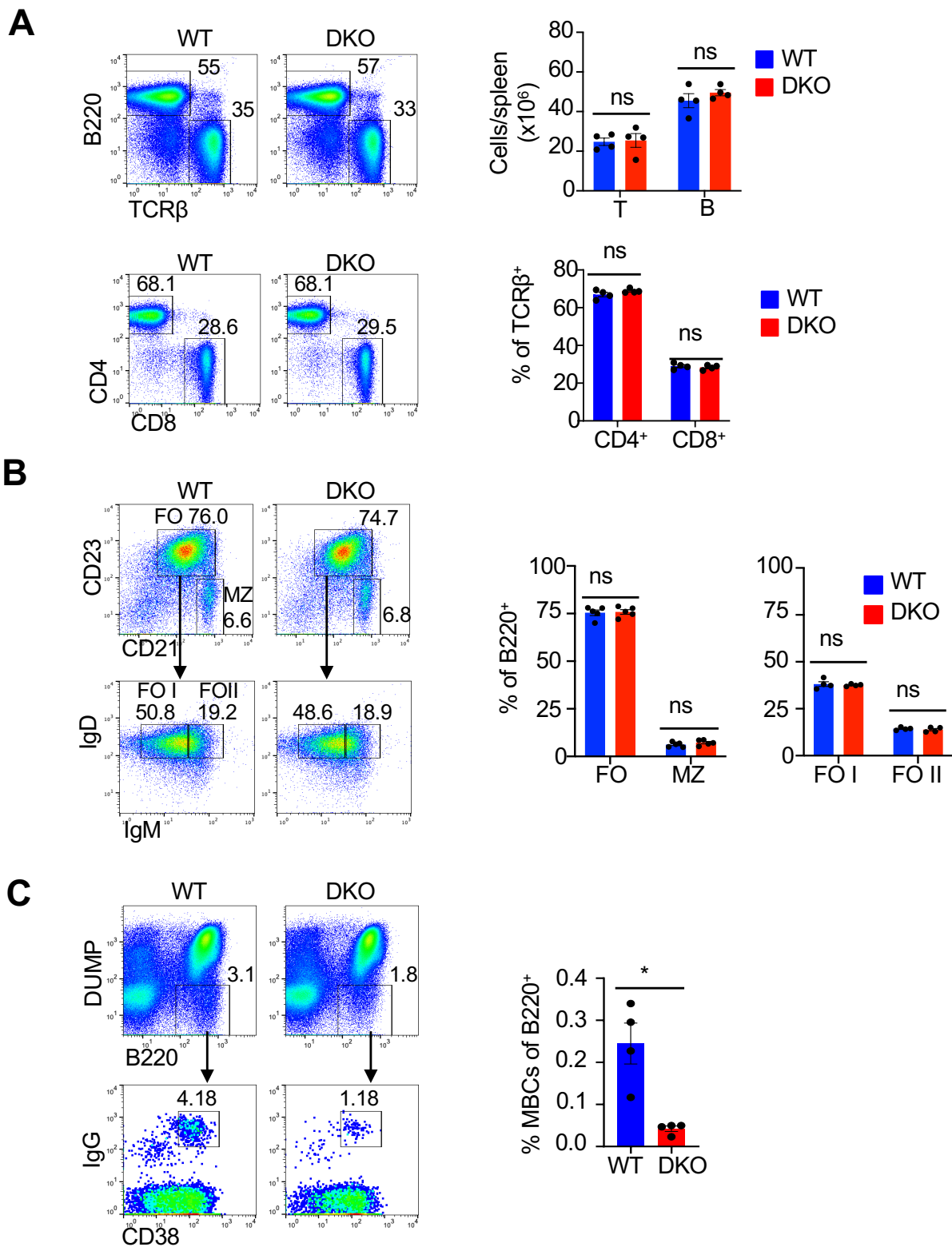
GC B cells



**Supplemental Figure 1.** Sorting of memory and GC B cells by flow cytometry. (A) Sorting of IgM-IgD-CD138-CD11b-CD11c-CD4-CD8<sup>-</sup> (DUMP<sup>-</sup>) B220<sup>+</sup>NP<sup>+</sup>IgG<sup>+</sup>CD38<sup>+</sup> NP-specific memory B cells from the spleen of C57BL/6 mice 8 weeks after immunization with NP-KLH. (B) Sorting of DUMP<sup>-</sup>B220<sup>+</sup>NP<sup>+</sup>IgG<sup>+</sup>CD38<sup>-</sup> NP-specific germinal center (GC) B cells from the spleen of C57BL/6 mice 2 weeks after immunization with NP-KLH.



**Supplemental Figure 2.** The expression of proteins that regulate mitochondrial autophagy. (A) Flow cytometry analyses of intracellular staining for Nix, Pink1, and Parkin in DUMP-B220<sup>+</sup>NP<sup>+</sup>IgG<sup>+</sup>CD38<sup>+</sup> memory B cells and DUMP-B220<sup>+</sup>IgG<sup>+</sup>GL-7<sup>+</sup>CD38<sup>-</sup> GC B cells. Dashed black line, isotype control; red line, GC B cell; blue line, memory B cell. Data are representative of three independent experiments. **\*\*** $P < 0.01$ ; ns = not statistically significant. (B) Splenocytes from wild type (WT) and AID-Cre/Nix<sup>ff</sup> mice were stained for cell surface markers, followed by intracellular staining for Nix. The cells were analyzed by flow cytometry. The staining for Nix was plotted for DUMP-B220<sup>+</sup>NP<sup>+</sup>IgG<sup>+</sup>CD38<sup>+</sup> memory B cells, CD4<sup>+</sup>CD44<sup>+</sup>CD62L<sup>+</sup> memory T cells and CD11c<sup>+</sup>CD11b<sup>+</sup> dendritic cells.



**Supplementary Figure 3.** Flow cytometry analyses of T and B cells in wild type and DKO mice. (A) Flow cytometry analyses of T and B cells in wild type (WT) and DKO mice. (B) Flow cytometry analyses of B220 $^+$ CD23 $^+$ CD21 $^{\text{lo}}$  follicular (FO) B cells, B220 $^+$ CD23 $^{\text{lo}}$ CD21 $^{\text{hi}}$  marginal zone (MZ) B cells. FO B cells are further gated into naive IgD $^+$ IgM $^{\text{low}}$  follicular type I (FO I) cells dependent on signaling from antigens, and IgD $^+$ IgM $^{\text{high}}$  follicular type II cells (FO II) cells independent of antigens for development (Cariappa et al., *J. Immunol.*179: 2270-2281). (C) Spontaneously arising DUMP $^+$ B220 $^+$ IgG $^+$ CD38 $^+$  memory B cells in wild type and DKO mice. Data are presented as mean  $\pm$  s.e.m. \* $P < 0.05$ ; ns = not significant.

Supplemental Table 1. DEGs in DKO memory B cells.

Genes up in DKO	Log2 fold change	FDR
<i>St6galnac1</i>	4.122999603	1.06E-08
<i>Rad9b</i>	4.096057929	2.19E-10
<i>Mdc1</i>	4.057110855	5.50E-10
<i>Aar2</i>	3.188840421	5.63E-06
<i>Catsper3</i>	3.127444228	5.75E-06
<i>Atg2b</i>	3.036940157	3.88E-09
<i>Sdhaf2</i>	2.977996082	8.47E-07
<i>Gm12333</i>	2.906201952	0.000381
<i>Abca17</i>	2.887343996	7.66E-09
<i>A230046K03Rik</i>	2.882175153	5.59E-08
<i>Gm14226</i>	2.874927335	0.000182
<i>G530011O06Rik</i>	2.834046061	0.000149
<i>Ecd</i>	2.807036229	2.32E-05
<i>Acsf3</i>	2.789620943	0.000301
<i>Sdhc</i>	2.776760722	0.000987
<i>Casc4</i>	2.742479596	1.59E-06
<i>Itgad</i>	2.728952859	1.57E-06
<i>Mttr7</i>	2.692508268	0.000196
<i>Uvssa</i>	2.588317437	3.18E-07
<i>Calu</i>	2.586958441	2.00E-06
<i>Fn3krp</i>	2.573733607	1.44E-05
<i>Pdik11</i>	2.560997293	4.93E-08
<i>Galnt1</i>	2.554133875	8.00E-05
<i>1300002E11Rik</i>	2.537337724	0.001117
<i>Alg8</i>	2.510902126	0.000594
<i>Dmbx1</i>	2.506447973	2.57E-05
<i>Pex1</i>	2.497877128	7.63E-06
<i>Ddx19b</i>	2.488873736	1.23E-05
<i>G6pc</i>	2.44471001	2.25E-05
<i>Gm14120</i>	2.406782098	0.001501
<i>Irf6</i>	2.330206977	0.001117
<i>Slmap</i>	2.32811851	1.15E-05
<i>Acly</i>	2.321266646	0.000224
<i>Brip1os</i>	2.307574175	0.002516
<i>Il2rb</i>	2.287528235	4.14E-05
<i>Il2ra2</i>	2.282754591	0.005847
<i>Anapc5</i>	2.254719685	4.45E-06
<i>Decr2</i>	2.25137893	5.31E-05
<i>Ahctf1</i>	2.236047564	6.93E-06
<i>Nphs1</i>	2.229174837	0.000145
<i>Mvp</i>	2.226061956	0.000728
<i>Lrrc16a</i>	2.204258314	2.69E-05
<i>Ccnj</i>	2.172857972	0.001309
<i>Sixn2</i>	2.170896004	0.00148
<i>Tctn2</i>	2.145187261	1.43E-05
<i>Kctd4</i>	2.122021983	0.002427
<i>Luc7l</i>	2.11554433	8.14E-06
<i>Metap1</i>	2.111368864	0.006833
<i>Klhl15</i>	2.098373168	0.018665
<i>R3hdm2</i>	2.084257426	0.000108
<i>Rapgef5</i>	2.083807872	0.000223
<i>Paqr5</i>	2.081510877	7.57E-05
<i>Rab8b</i>	1.987536997	0.000452
<i>Parp12</i>	1.984149355	0.00046
<i>Slc17a2</i>	1.980760236	0.000661
<i>Psmb7</i>	1.94978778	0.004053
<i>A430093F15Rik</i>	1.917944034	0.001309
<i>Irfar1</i>	1.905155283	0.001043
<i>Nol9</i>	1.900266549	0.000196
<i>Pbx3</i>	1.842448445	0.002243
<i>Ankrd13a</i>	1.812579063	0.000927
<i>Ifr74</i>	1.808379143	0.01137
<i>Sptan1</i>	1.800762142	0.000438
<i>Cramp1l</i>	1.794223352	0.00026
<i>Polr2a</i>	1.793453006	0.000197
<i>Ago3</i>	1.772806606	3.15E-05
<i>Pank2</i>	1.768896218	0.002836
<i>Cybrd1</i>	1.767930057	0.000915
<i>Zfp709</i>	1.764812139	0.000203

Genes up in DKO	Log2 fold change	FDR
<i>Ddx42</i>	1.744424048	0.00046
<i>Ms4a7</i>	1.742795652	0.03185
<i>Pak2</i>	1.741096729	0.00046
<i>Srpk1</i>	1.737212042	4.31E-05
<i>Cul2</i>	1.7312104	0.003526
<i>Pum1</i>	1.719740714	0.000236
<i>F830045P16Rik</i>	1.714444326	0.022947
<i>Zbtb6</i>	1.711027477	0.008781
<i>Nktr</i>	1.708668356	0.000341
<i>Slc35a5</i>	1.707351827	0.012114
<i>Cd200r3</i>	1.69342454	0.002968
<i>2010012O05Rik</i>	1.69052754	0.023758
<i>Rbm27</i>	1.685148137	0.023147
<i>Cse1l</i>	1.676691843	0.00026
<i>Nrd1</i>	1.675381451	0.003904
<i>0610007P14Rik</i>	1.659967784	0.004531
<i>Dgkg</i>	1.647853475	0.000767
<i>Rragc</i>	1.637017196	0.001116
<i>Fbxw2</i>	1.613828714	0.004671
<i>Cep104</i>	1.613205142	0.022844
<i>Acss2</i>	1.603774842	0.011012
<i>Eya3</i>	1.559369514	0.001346
<i>Gbp4</i>	1.557062563	0.004896
<i>Dhrs2</i>	1.533657655	0.022844
<i>Nufip2</i>	1.531617208	0.012081
<i>Kdm1a</i>	1.517307632	0.001573
<i>Gm14245</i>	1.515283847	0.00996
<i>Cep128</i>	1.512284028	0.003104
<i>Sntb2</i>	1.510850398	0.031863
<i>Dis3l2</i>	1.506210315	0.003049
<i>BC028471</i>	1.502929328	0.008493
<i>Zyg11b</i>	1.500837136	0.000705
<i>Psmc7</i>	1.462035163	0.040493
<i>Map3k12</i>	1.460097746	0.008512
<i>Dnmt3b</i>	1.449613993	0.008066
<i>Klhdc2</i>	1.445716933	0.018138
<i>Med23</i>	1.427999534	0.010952
<i>Dpy19l4</i>	1.426271602	0.0074
<i>App1</i>	1.41376369	0.005242
<i>Hps5</i>	1.405853915	0.002234
<i>Ube2r2</i>	1.398074655	0.044242
<i>Map3k19</i>	1.389880011	0.007579
<i>Mtf1</i>	1.384271061	0.022868
<i>Mycbp2</i>	1.361482534	0.001348
<i>Dpf2</i>	1.35961585	0.01085
<i>Ptpn9</i>	1.357199657	0.01906
<i>Fam149b</i>	1.34939751	0.022825
<i>Pbrm1</i>	1.343160271	0.006738
<i>0610037L13Rik</i>	1.32947624	0.008452
<i>RP23-180L12.5</i>	1.324305008	0.008461
<i>Gm7120</i>	1.311438593	0.020112
<i>Tgm4</i>	1.305743634	0.01906
<i>Capn7</i>	1.304944606	0.01028
<i>Atxn1</i>	1.296453063	0.02088
<i>Ncor1</i>	1.284714714	0.00424
<i>Esd</i>	1.28141259	0.040872
<i>A530013C23Rik</i>	1.273807444	0.044242
<i>Rbbp4</i>	1.269519138	0.011993
<i>Zranb3</i>	1.261998631	0.031144
<i>Rhot1</i>	1.254618003	0.006258
<i>Rdx</i>	1.250820206	0.027614
<i>Nf1</i>	1.240638259	0.005038
<i>Brca1</i>	1.239349513	0.012779
<i>Nfatc3</i>	1.234409798	0.024464
<i>Lrp2</i>	1.231376792	0.019693
<i>Dnase1l3</i>	1.227773081	0.025179
<i>Zfp143</i>	1.223115815	0.020401
<i>Golga3</i>	1.223039941	0.014168
<i>Tmem183a</i>	1.203720453	0.037793

Genes up in DKO	Log2 fold change	FDR
<i>Cdca5</i>	1.19176391	0.015313
<i>Parp14</i>	1.190749987	0.033721
<i>Serac1</i>	1.189947428	0.03069
<i>Nmt2</i>	1.187961067	0.025561
<i>Dixdc1</i>	1.181876321	0.039747
<i>Unc80</i>	1.156367754	0.018756
<i>Qsox2</i>	1.150439661	0.040872
<i>Tet1</i>	1.126183963	0.024082
<i>Prkcb</i>	1.122446808	0.04879
<i>Rbbp6</i>	1.109116172	0.023758
<i>Txndc16</i>	1.108430438	0.046727
<i>Commf2</i>	1.097159779	0.039196
<i>Dnah12</i>	1.090361472	0.035869
<i>Rad51</i>	1.087325313	0.028755
<i>Nlrp4g</i>	1.082880468	0.038062
<i>Slk</i>	1.074205973	0.02388
<i>Efr3a</i>	1.071240718	0.047312
<i>Ddx5</i>	1.068705713	0.04493
<i>Tug1</i>	1.047291675	0.045817
<i>Phff1</i>	1.045643562	0.03101
<i>Kpnb1</i>	1.042070824	0.0237
<i>Trp53bp1</i>	1.028233712	0.037354
<i>4933427D14Rik</i>	1.027100219	0.040549
<i>Gapvd1</i>	1.02667783	0.025561
<i>Gm1564</i>	1.021188194	0.038917
<i>Vps4b</i>	1.012667825	0.045494
<i>Brd2</i>	1.000114741	0.04466
<i>Trpm7</i>	0.961857391	0.045138
<i>2610507B11Rik</i>	0.951462023	0.026563
<i>Ern1</i>	0.86155012	0.049354
<i>Herc1</i>	0.837804502	0.034702

Genes down in DKO	Log2 fold change	FDR
<i>Dlg2</i>	-2.470499333	6.15E-07
<i>Arrdc4</i>	-2.521807518	9.58E-08
<i>Chst15</i>	-2.525201801	2.01E-09
<i>Ank3</i>	-2.547251164	1.41E-07
<i>Snx30</i>	-2.577621882	2.01E-09
<i>Neil3</i>	-2.582525888	3.03E-09
<i>Dlgap5</i>	-2.59348869	9.52E-08
<i>Gm13857</i>	-2.600710033	3.12E-08
<i>Nagk</i>	-2.618133159	1.26E-06
<i>Kif1a</i>	-2.62000992	3.03E-09
<i>Mrp1</i>	-2.644611195	8.22E-07
<i>Igdccc4</i>	-2.679163882	4.19E-06
<i>Lypla1</i>	-2.68174155	2.19E-10
<i>mt-Nd4l</i>	-2.720122045	2.44E-07
<i>Kpna2</i>	-2.72706202	4.93E-08
<i>Rnf122</i>	-2.760744697	0.000145
<i>Ppil6</i>	-2.770236023	2.66E-06
<i>Plcg1</i>	-2.770243594	3.66E-09
<i>Gls2</i>	-2.791254461	5.01E-08
<i>2810007J24Rik</i>	-2.855011679	1.50E-05
<i>Slc22a12</i>	-2.938237704	0.004531
<i>Tbc1d8</i>	-2.953640948	1.16E-09
<i>Arhgef7</i>	-3.000479244	4.48E-10
<i>Ltf</i>	-3.040991579	1.16E-09
<i>Vmn2r60</i>	-3.051204506	3.75E-08
<i>Rbm26</i>	-3.066352422	2.34E-09
<i>Ube2u</i>	-3.074919462	4.85E-08
<i>Gm11400</i>	-3.172592438	3.30E-10
<i>Heat2</i>	-3.186045797	2.05E-08
<i>Col7a1</i>	-3.271949745	7.87E-11
<i>RP23-8J15.2</i>	-3.323651289	2.78E-09
<i>Aip</i>	-3.363138595	3.71E-11
<i>Tmem44</i>	-3.842169955	2.83E-12
<i>Gm8979</i>	-3.850449842	7.60E-07
<i>4933426M11Rik</i>	-4.245422775	3.53E-17