

Table S1. The top 100 genes with a significant expression change between the two time points - day 30 and day 60 for the WT midbrain organoids.

Gene	p_value	morans_test_statistic	q_value
TAGLN2	0	38.11437	0
TMSB10	0	44.69823	0
SLC5A7	0	58.06673	0
SCG2	0	46.48832	0
GAP43	0	72.92436	0
SST	0	47.13697	0
PHOX2B	0	58.04957	0
AC105389.3	0	39.63936	0
LINC00682	0	47.25301	0
ISL1	0	50.60657	0
SLIT3	0	47.26864	0
NRN1	0	37.86831	0
ARHGAP36	0	38.03508	0
NEFM	0	40.91652	0
NEFL	0	70.73235	0
STMN2	0	47.32075	0
PHOX2A	0	40.38706	0
LAYN	0	41.79922	0
SNCG	0	38.97542	0
CALY	0	38.27564	0
TAC3	0	38.39052	0
RTN1	0	48.37341	0
ANXA2	0	46.8574	0
MAF	0	41.05048	0
GNAS	0	44.89943	0
MT-RNR2	0	37.69207	0
MT-ND1	0	45.7606	0
MT-ND2	0	48.14412	0
MT-CO1	0	63.38316	0
MT-CO2	0	56.38167	0
MT-ATP6	0	46.41531	0
MT-CO3	0	57.01367	0
MT-ND3	0	49.06381	0
MT-ND4L	0	48.60588	0
MT-ND4	0	63.23224	0
MT-ND5	0	57.26671	0
MT-CYB	0	53.05798	0
SNCA	2.01E-305	37.33761	1.10E-302
SH3BGRL3	3.19E-293	36.57806	1.70E-290
CRABP1	5.24E-284	35.99374	2.72E-281

CDKN1A	1.83E-278	35.63762	9.29E-276
MAB21L2	5.27E-276	35.47854	2.61E-273
TLX1	2.57E-272	35.23852	1.24E-269
NHLH1	2.05E-262	34.58598	9.69E-260
UCHL1	1.66E-261	34.52558	7.66E-259
SLC2A1	2.31E-257	34.24833	1.04E-254
SHOX2	1.02E-255	34.13775	4.49E-253
VIM	2.49E-254	34.04397	1.08E-251
MTATP6P1	2.86E-252	33.90447	1.21E-249
SLC17A6	3.90E-248	33.62275	1.62E-245
ID4	2.93E-244	33.35652	1.19E-241
TCF4	1.22E-235	32.75665	4.88E-233
STMN1	2.23E-233	32.59749	8.73E-231
RGMB	1.42E-231	32.46991	5.46E-229
TUBA1B	3.42E-231	32.4428	1.29E-228
H3F3B	3.43E-228	32.22928	1.27E-225
EBF1	2.26E-223	31.88347	8.25E-221
SOX4	1.11E-222	31.83358	3.98E-220
MALAT1	7.53E-218	31.48253	2.65E-215
LHX2	4.90E-210	30.90641	1.70E-207
AC010478.1	9.75E-203	30.35833	3.32E-200
ROBO3	2.13E-196	29.87425	7.12E-194
SLC10A4	3.93E-190	29.3878	1.30E-187
SV2C	5.00E-185	28.98561	1.62E-182
RND3	5.83E-185	28.98029	1.86E-182
DDR1	1.10E-183	28.87885	3.46E-181
DLL1	1.70E-183	28.86381	5.27E-181
MAPT	8.11E-178	28.40777	2.48E-175
S100A6	2.68E-177	28.36569	8.07E-175
TCF12	3.32E-174	28.11378	9.87E-172
CNR1	1.53E-170	27.81254	4.48E-168
TBX2	1.33E-169	27.73474	3.84E-167
FEV	4.36E-168	27.60879	1.24E-165
NEUROD2	4.46E-167	27.52458	1.25E-164
CCK	5.46E-167	27.51723	1.51E-164
SOX11	1.29E-166	27.48592	3.54E-164
LY6H	1.61E-164	27.30997	4.36E-162
LINC01158	3.95E-162	27.10813	1.05E-159
TUBB2A	6.23E-156	26.57721	1.64E-153
UTS2	5.28E-155	26.49678	1.37E-152
RPS27L	6.35E-151	26.14032	1.63E-148

LBX1	6.41E-150	26.05184	1.62E-147
CHL1	3.81E-147	25.80591	9.53E-145
EDIL3	4.99E-139	25.07231	1.23E-136
FTL	1.01E-136	24.85992	2.47E-134
NPPA	1.51E-135	24.75114	3.64E-133
RCAN3	7.14E-135	24.68831	1.71E-132
LAMP5	2.89E-134	24.6317	6.83E-132
BASP1	2.97E-133	24.53704	6.94E-131
ADM	9.42E-133	24.49009	2.17E-130
TFRC	1.03E-128	24.10792	2.36E-126
DLC1	2.50E-128	24.07125	5.65E-126
DCX	3.11E-128	24.06226	6.94E-126
NSG2	1.50E-127	23.99698	3.31E-125
LYPD1	4.24E-126	23.85743	9.27E-124
YWHAH	5.62E-125	23.74901	1.22E-122
MT-RNR1	4.28E-124	23.66355	9.17E-122
RBMS1	8.67E-124	23.63377	1.84E-121
EBF3	1.23E-123	23.61891	2.59E-121
C1orf61	4.80E-123	23.5614	9.97E-121

Table S2. The top 100 genes with a significant expression change between the two time points - day 30 and day 60 for the MIRO1-PD midbrain organoids.

Gene	p_value	morans_test_statistic	q_value
CAMK2N1	0	50.66858	0
STMN1	0	46.66235	0
NHLH1	0	55.7692	0
ATP1B1	0	69.66597	0
CNTN2	0	43.7615	0
LYPD1	0	49.32273	0
RND3	0	61.33213	0
NDNF	0	42.11496	0
HMGCS1	0	39.61499	0
RGMB	0	49.36704	0
PEG10	0	65.40369	0
NEFM	0	37.71724	0
NEFL	0	56.53903	0
DUSP4	0	46.23796	0
BNC2	0	44.04329	0
ROBO3	0	50.96962	0
CRABP1	0	52.96983	0
CBLN1	0	42.36286	0
TOX3	0	51.36249	0
MAF	0	50.36909	0
MAPT	0	43.62036	0
VSTM2L	0	43.73836	0
MAFB	0	43.29908	0
TCF4	1.76E-302	37.15596	1.92E-299
B3GAT2	9.61E-302	37.11021	1.01E-298
TH	1.54E-301	37.09758	1.55E-298
DRGX	1.11E-294	36.66975	1.08E-291
DCC	1.15E-293	36.60602	1.07E-290
LHX2	1.90E-288	36.27647	1.72E-285
MT-CO3	3.48E-287	36.19627	3.04E-284
METRNL	1.04E-285	36.10232	8.82E-283
PGM2L1	1.27E-271	35.19315	1.04E-268
SLC35F4	3.41E-269	35.0341	2.70E-266
DCX	1.79E-258	34.3229	1.38E-255
EBF1	4.85E-255	34.092	3.63E-252
AC092376.2	7.88E-255	34.07774	5.74E-252
TMSB4X	2.18E-251	33.84465	1.54E-248
NRN1	1.11E-247	33.59176	7.63E-245
EBF3	2.17E-242	33.22726	1.46E-239
NEUROD2	2.07E-241	33.15942	1.36E-238

TAGLN3	6.80E-241	33.12361	4.34E-238
TUBB2A	3.24E-240	33.07642	2.02E-237
SOX11	6.18E-239	32.98727	3.77E-236
GAP43	1.83E-235	32.74437	1.09E-232
MT-CO1	1.28E-230	32.40213	7.46E-228
MAFA	2.45E-228	32.23968	1.40E-225
CCNI	3.78E-226	32.08323	2.11E-223
ECEL1	2.16E-221	31.74028	1.18E-218
UCHL1	8.68E-218	31.47802	4.65E-215
MT-ND4	2.67E-216	31.36908	1.40E-213
MT-CO2	4.00E-215	31.28279	2.06E-212
ETFB	1.02E-213	31.17912	5.15E-211
MT-CYB	2.64E-209	30.85186	1.31E-206
LGI2	5.36E-209	30.82896	2.60E-206
KITLG	3.70E-194	29.70121	1.77E-191
NFIA	6.24E-190	29.3721	2.92E-187
INSM1	5.58E-187	29.14006	2.57E-184
FTH1	1.13E-186	29.11584	5.11E-184
CRABP2	2.96E-186	29.0828	1.32E-183
CBLN2	5.19E-181	28.66518	2.27E-178
LY6H	3.19E-178	28.44058	1.37E-175
MMD	6.83E-176	28.25146	2.89E-173
TSHZ2	8.07E-175	28.16402	3.36E-172
SOX4	8.86E-171	27.83214	3.63E-168
CDC42	4.43E-169	27.69138	1.79E-166
NPTX2	9.03E-166	27.41523	3.59E-163
NFIB	5.64E-163	27.1797	2.21E-160
ID2	2.85E-162	27.12016	1.10E-159
HES6	1.33E-160	26.97814	5.07E-158
VGf	6.83E-160	26.91762	2.56E-157
NRCAM	2.64E-159	26.86737	9.76E-157
BASP1	4.46E-159	26.84794	1.62E-156
LMO4	9.47E-158	26.73403	3.40E-155
PCDH9	1.42E-154	26.45949	5.03E-152
PCBP4	1.23E-153	26.37794	4.29E-151
C1orf61	9.58E-153	26.30003	3.30E-150
PCDH7	1.16E-152	26.29279	3.95E-150
TMSB10	5.78E-150	26.05578	1.94E-147
EZR	9.35E-149	25.94893	3.10E-146
CHD7	1.59E-144	25.57145	5.19E-142
YWHAH	7.25E-144	25.512	2.35E-141

RBP1	1.97E-143	25.4729	6.22E-141
KCTD12	1.96E-143	25.47304	6.22E-141
IGFBP2	4.81E-143	25.43784	1.50E-140
MT-ATP6	6.25E-143	25.4276	1.93E-140
CHMP2B	7.18E-143	25.42212	2.19E-140
LINC01158	7.64E-143	25.41971	2.30E-140
MEIS2	3.84E-141	25.26535	1.14E-138
DOK6	1.81E-139	25.11261	5.33E-137
CSRP2	4.95E-139	25.07257	1.44E-136
RCOR2	6.42E-138	24.97036	1.85E-135
NGEF	1.03E-137	24.95143	2.94E-135
SNN	6.74E-137	24.87617	1.90E-134
SOX8	3.32E-135	24.71925	9.26E-133
MT-ND5	2.58E-134	24.63624	7.13E-132
CRNDE	3.03E-132	24.44241	8.27E-130
GSTP1	4.81E-132	24.42351	1.30E-129
TSHZ3	1.87E-131	24.36791	5.01E-129
NKAIN4	7.15E-131	24.31297	1.89E-128
CALY	1.75E-130	24.27624	4.58E-128