

Table S1. Expression levels of mRNA in wild type and clock gene mutant mice compared with each other. T-test represents correlation among groups: (T-test-1)- C57BL/6 vs Bmal1^{-/-}, (T-test-2)- C57BL/6 vs Cry1/2, (T-test-3)- Bmal1^{-/-} vs Cry1/2.

CJL group								
Genes	C57BL/6 ± SEM	T-test-1	Bmal1 ^{-/-} ± SEM	T-test-2	Cry1/2 ± SEM	T-test-3		
PFC								
<i>Akt1</i>	0.073 ± 0.031	0.201	0.180 ± 0.058	0.001	1.000 ± 0.000	0.005		
<i>Akt2</i>	0.145 ± 0.033	0.640	0.173 ± 0.044	0.281	0.096 ± 0.020	0.214		
<i>Araf</i>	0.181 ± 0.037	0.068	2.131 ± 0.541	0.002	0.822 ± 0.009	0.136		
<i>Bcr</i>	0.192 ± 0.068	0.537	0.139 ± 0.030	0.001	1.337 ± 0.041	0.001		
<i>Bin1</i>	0.201 ± 0.048	0.093	0.411 ± 0.076	0.225	0.118 ± 0.029	0.047		
<i>Ccnd1</i>	0.242 ± 0.059	0.159	0.411 ± 0.076	0.716	0.214 ± 0.044	0.105		
<i>Crem</i>	0.465 ± 0.108	0.312	0.734 ± 0.195	0.097	1.155 ± 0.253	0.262		
<i>Dact1</i>	0.315 ± 0.082	0.492	0.240 ± 0.052	0.085	0.061 ± 0.016	0.065		
<i>Dlg1</i>	0.635 ± 0.143	0.740	0.703 ± 0.127	0.343	0.459 ± 0.014	0.193		
<i>Fzr1</i>	0.049 ± 0.014	0.062	0.950 ± 0.237	0.880	0.052 ± 0.003	0.063		
<i>Gpx3</i>	0.049 ± 0.014	0.077	0.331 ± 0.086	0.180	0.321 ± 0.135	0.950		
<i>Klf5</i>	0.082 ± 0.032	0.336	0.213 ± 0.104	0.009	0.764 ± 0.087	0.016		
<i>Kras</i>	0.006 ± 0.001	0.047	1.611 ± 0.360	0.029	0.082 ± 0.014	0.051		
<i>Nf1</i>	0.069 ± 0.024	0.072	0.367 ± 0.090	0.114	1.186 ± 0.415	0.182		
<i>Gsk3b</i>	0.036 ± 0.005	0.054	0.355 ± 0.078	0.975	0.036 ± 0.008	0.053		
<i>Pdgfb</i>	0.312 ± 0.089	0.664	0.253 ± 0.088	0.871	0.295 ± 0.036	0.697		
<i>Pik3r1</i>	0.086 ± 0.036	0.192	0.016 ± 0.004	0.047	0.408 ± 0.085	0.044		
<i>Prdm16</i>	0.037 ± 0.009	0.040	0.442 ± 0.085	0.012	0.284 ± 0.033	0.197		
<i>Prkaa2</i>	0.571 ± 0.307	0.617	0.760 ± 0.141	0.826	0.679 ± 0.345	0.844		
<i>Rap1gap</i>	0.188 ± 0.047	0.472	0.141 ± 0.035	0.001	1.837 ± 0.036	0.000		
<i>Robo1</i>	0.305 ± 0.091	0.155	0.722 ± 0.196	0.236	0.662 ± 0.216	0.847		
<i>sin3</i>	0.104 ± 0.025	0.229	0.191 ± 0.052	0.253	0.065 ± 0.009	0.131		
NAc								
<i>Akt1</i>	0.021 ± 0.004	0.039	0.235 ± 0.044	0.001	1.000 ± 0.000	0.003		
<i>Akt2</i>	0.030 ± 0.002	0.366	0.040 ± 0.009	0.174	0.081 ± 0.025	0.239		
<i>Araf</i>	0.043 ± 0.007	0.058	1.073 ± 0.260	0.019	4.263 ± 0.584	0.019		
<i>Bcr</i>	0.078 ± 0.017	0.052	0.877 ± 0.192	0.020	0.498 ± 0.069	0.179		
<i>Bin1</i>	0.046 ± 0.021	0.281	0.081 ± 0.018	0.007	0.954 ± 0.088	0.008		
<i>Ccnd1</i>	0.027 ± 0.013	0.063	0.244 ± 0.060	0.006	0.873 ± 0.072	0.003		
<i>Crem</i>	0.036 ± 0.007	0.060	0.242 ± 0.054	0.009	3.287 ± 0.313	0.009		
<i>Dact1</i>	0.032 ± 0.002	0.049	0.018 ± 0.004	0.014	2.340 ± 0.273	0.014		
<i>Dlg1</i>	0.153 ± 0.011	0.122	0.398 ± 0.095	0.014	1.115 ± 0.118	0.010		
<i>Fzr1</i>	0.063 ± 0.012	0.062	0.471 ± 0.108	0.842	0.060 ± 0.003	0.062		
<i>Gpx3</i>	0.054 ± 0.011	0.075	0.153 ± 0.032	0.008	0.313 ± 0.031	0.023		

<i>Klf5</i>	0.127 ± 0.025	0.039	0.007 ± 0.002	0.198	0.082 ± 0.008	0.008
<i>Kras</i>	0.012 ± 0.001	0.064	0.482 ± 0.128	0.007	0.642 ± 0.055	0.340
<i>Nf1</i>	0.034 ± 0.010	0.126	0.079 ± 0.019	0.022	0.555 ± 0.082	0.023
<i>Gsk3b</i>	0.074 ± 0.012	0.066	0.476 ± 0.110	0.026	0.744 ± 0.112	0.164
<i>Pdgfb</i>	0.098 ± 0.016	0.718	0.088 ± 0.020	0.005	2.077 ± 0.140	0.004
<i>Pik3r1</i>	0.061 ± 0.019	0.778	0.055 ± 0.013	0.167	0.102 ± 0.014	0.067
<i>Prdm16</i>	0.030 ± 0.021	0.051	0.316 ± 0.074	0.019	2.207 ± 0.310	0.021
<i>Prkaa2</i>	0.053 ± 0.014	0.049	0.467 ± 0.098	0.227	0.119 ± 0.039	0.056
<i>Rap1gap</i>	0.324 ± 0.112	0.206	0.120 ± 0.027	0.146	0.594 ± 0.100	0.034
<i>Robo1</i>	0.044 ± 0.015	0.051	1.109 ± 0.252	0.001	0.375 ± 0.013	0.100
<i>sin3</i>	0.066 ± 0.029	0.042	0.564 ± 0.114	0.001	0.545 ± 0.033	0.887

Hippocampus

<i>Akt1</i>	0.115 ± 0.029	0.539	0.089 ± 0.024	0.001	1.000 ± 0.000	0.002
<i>Akt2</i>	0.182 ± 0.088	0.045	2.111 ± 0.446	0.023	0.625 ± 0.040	0.078
<i>Araf</i>	0.514 ± 0.198	0.779	0.589 ± 0.147	0.016	4.263 ± 0.584	0.019
<i>Bcr</i>	0.358 ± 0.030	0.059	2.417 ± 0.526	0.168	0.498 ± 0.069	0.065
<i>Bin1</i>	0.654 ± 0.167	0.357	0.923 ± 0.196	0.070	3.288 ± 0.773	0.084
<i>Cnd1</i>	0.665 ± 0.183	0.388	0.457 ± 0.097	0.038	1.998 ± 0.335	0.036
<i>Crem</i>	0.445 ± 0.113	0.083	0.086 ± 0.019	0.004	1.888 ± 0.180	0.009
<i>Dact1</i>	0.677 ± 0.187	0.739	0.595 ± 0.126	0.054	1.344 ± 0.157	0.022
<i>Dlg1</i>	0.867 ± 0.226	0.128	0.322 ± 0.068	0.403	1.115 ± 0.118	0.009
<i>Fzr1</i>	0.293 ± 0.124	0.290	0.494 ± 0.107	0.899	0.276 ± 0.014	0.176
<i>Gpx3</i>	0.038 ± 0.010	0.050	1.822 ± 0.416	0.010	1.436 ± 0.141	0.457
<i>Klf5</i>	0.415 ± 0.150	0.242	0.745 ± 0.186	0.004	3.006 ± 0.288	0.005
<i>Kras</i>	0.438 ± 0.115	0.082	0.068 ± 0.015	0.212	0.642 ± 0.055	0.006
<i>Nf1</i>	1.093 ± 0.276	0.143	0.473 ± 0.096	0.236	0.638 ± 0.094	0.288
<i>Gsk3b</i>	0.395 ± 0.163	0.395	0.592 ± 0.123	0.162	0.744 ± 0.112	0.413
<i>Pdgfb</i>	0.376 ± 0.296	0.544	0.608 ± 0.177	0.079	1.707 ± 0.450	0.121
<i>Pik3r1</i>	0.256 ± 0.047	0.086	2.282 ± 0.639	0.060	0.466 ± 0.063	0.103
<i>Prdm16</i>	0.376 ± 0.100	0.973	0.381 ± 0.083	0.580	0.448 ± 0.063	0.555
<i>Prkaa2</i>	0.068 ± 0.019	0.294	1.042 ± 0.691	0.451	0.087 ± 0.012	0.301
<i>Rap1gap</i>	0.471 ± 0.153	0.415	0.737 ± 0.242	0.543	0.594 ± 0.100	0.629
<i>Robo1</i>	0.159 ± 0.043	0.072	0.514 ± 0.112	0.006	1.722 ± 0.059	0.002
<i>sin3</i>	0.247 ± 0.065	0.445	0.462 ± 0.225	0.001	2.504 ± 0.151	0.003

Hypothalamus

<i>Akt1</i>	0.293 ± 0.077	0.242	0.169 ± 0.029	0.012	1.000 ± 0.000	0.001
<i>Akt2</i>	0.049 ± 0.013	0.273	0.071 ± 0.011	0.861	0.053 ± 0.017	0.446
<i>Araf</i>	0.212 ± 0.086	0.602	0.266 ± 0.037	0.018	4.263 ± 0.584	0.020
<i>Bcr</i>	0.264 ± 0.080	0.738	0.232 ± 0.032	0.315	0.159 ± 0.022	0.140
<i>Bin1</i>	0.032 ± 0.008	0.130	0.433 ± 0.161	0.228	2.367 ± 1.360	0.290
<i>Cnd1</i>	0.161 ± 0.042	0.074	0.288 ± 0.024	0.078	0.663 ± 0.159	0.139
<i>Crem</i>	0.081 ± 0.021	0.093	0.314 ± 0.080	0.009	1.888 ± 0.180	0.005
<i>Dact1</i>	0.054 ± 0.014	0.011	0.336 ± 0.039	0.014	1.344 ± 0.157	0.018
<i>Dlg1</i>	0.292 ± 0.076	0.098	0.070 ± 0.007	0.007	1.115 ± 0.118	0.012

<i>Fzr1</i>	0.106 ± 0.049	0.144	0.229 ± 0.047	0.422	1.92 ± 1.28	0.423
<i>Gpx3</i>	0.013 ± 0.003	0.417	0.574 ± 0.553	0.401	0.590 ± 0.545	0.985
<i>Klf5</i>	0.252 ± 0.002	0.001	0.047 ± 0.005	0.011	3.006 ± 0.288	0.009
<i>Kras</i>	0.088 ± 0.023	0.484	0.068 ± 0.006	0.427	0.303 ± 0.218	0.393
<i>Nf1</i>	0.112 ± 0.029	0.268	0.068 ± 0.010	0.478	0.327 ± 0.249	0.407
<i>Gsk3b</i>	0.098 ± 0.015	0.053	0.046 ± 0.007	0.027	0.744 ± 0.112	0.025
<i>Pdgfb</i>	0.512 ± 0.088	0.038	0.075 ± 0.005	0.368	0.330 ± 0.151	0.232
<i>Pik3r1</i>	0.023 ± 0.001	0.050	0.051 ± 0.007	0.073	0.041 ± 0.006	0.344
<i>Prdm16</i>	0.208 ± 0.054	0.077	0.390 ± 0.055	0.162	0.330 ± 0.046	0.453
<i>Prkaa2</i>	0.045 ± 0.012	0.095	0.009 ± 0.001	0.088	0.008 ± 0.001	0.348
<i>Rap1gap</i>	0.320 ± 0.109	0.385	0.451 ± 0.076	0.605	0.392 ± 0.066	0.592
<i>Robo1</i>	0.093 ± 0.024	0.974	0.094 ± 0.003	0.334	0.124 ± 0.004	0.006
<i>sin3</i>	0.018 ± 0.005	0.062	0.426 ± 0.107	0.004	2.504 ± 0.151	0.001

Striatum

<i>Akt1</i>	1.143 ± 0.251	0.891	1.092 ± 0.246	0.626	1.000 ± 0.000	0.745
<i>Akt2</i>	0.059 ± 0.013	0.049	0.635 ± 0.134	0.237	2.204 ± 1.284	0.346
<i>Araf</i>	0.511 ± 0.113	0.041	6.982 ± 1.368	0.168	0.742 ± 0.045	0.045
<i>Bcr</i>	3.843 ± 0.840	0.118	1.687 ± 0.181	0.792	3.371 ± 1.417	0.356
<i>Bin1</i>	0.809 ± 0.161	0.782	0.743 ± 0.153	0.114	2.550 ± 0.667	0.107
<i>Cend1</i>	2.759 ± 0.612	0.183	5.052 ± 1.180	0.325	1.706 ± 0.710	0.086
<i>Crem</i>	1.005 ± 0.220	0.220	1.559 ± 0.304	0.402	2.031 ± 0.971	0.682
<i>Dact1</i>	0.115 ± 0.026	0.971	0.114 ± 0.023	0.072	5.677 ± 1.583	0.072
<i>Dlg1</i>	1.974 ± 0.868	0.834	2.200 ± 0.485	0.173	0.170 ± 0.045	0.051
<i>Fzr1</i>	0.586 ± 0.128	0.060	2.404 ± 0.501	0.355	0.432 ± 0.050	0.057
<i>Gpx3</i>	0.774 ± 0.171	0.436	0.999 ± 0.195	0.080	6.098 ± 1.624	0.086
<i>Klf5</i>	0.618 ± 0.141	0.054	0.044 ± 0.011	0.153	1.604 ± 0.453	0.075
<i>Kras</i>	0.318 ± 0.070	0.057	7.841 ± 1.875	0.098	1.581 ± 0.436	0.072
<i>Nf1</i>	1.482 ± 0.344	0.082	4.630 ± 1.038	0.071	0.329 ± 0.084	0.053
<i>Gsk3b</i>	0.597 ± 0.139	0.057	2.637 ± 0.546	0.058	0.059 ± 0.018	0.042
<i>Pdgfb</i>	1.710 ± 0.386	0.087	0.566 ± 0.115	0.049	0.040 ± 0.012	0.044
<i>Pik3r1</i>	0.491 ± 0.164	0.052	2.157 ± 0.447	0.176	1.764 ± 0.634	0.641
<i>Prdm16</i>	1.161 ± 0.274	0.115	0.472 ± 0.099	0.071	0.231 ± 0.056	0.120
<i>Prkaa2</i>	0.491 ± 0.260	0.622	0.339 ± 0.068	0.177	1.568 ± 0.545	0.151
<i>Rap1gap</i>	1.850 ± 1.018	0.803	1.553 ± 0.305	0.694	1.377 ± 0.302	0.704
<i>Robo1</i>	0.615 ± 0.134	0.061	2.048 ± 0.410	0.158	1.445 ± 0.392	0.348
<i>sin3</i>	0.132 ± 0.029	0.050	1.064 ± 0.221	0.090	4.780 ± 0.513	0.104

Sham group

PFC

<i>Akt1</i>	0.067 ± 0.011	0.088	0.582 ± 0.165	0.001	1.000 ± 0.000	0.126
<i>Akt2</i>	0.158 ± 0.026	0.061	2.446 ± 0.592	0.157	0.095 ± 0.026	0.058
<i>Araf</i>	0.062 ± 0.025	0.055	3.885 ± 0.939	0.066	0.413 ± 0.101	0.064
<i>Bcr</i>	0.251 ± 0.043	0.727	0.282 ± 0.068	0.060	4.263 ± 1.033	0.061
<i>Bin1</i>	0.509 ± 0.080	0.116	1.163 ± 0.258	0.036	0.188 ± 0.051	0.058
<i>Cend1</i>	0.268 ± 0.063	0.068	1.994 ± 0.482	0.085	0.087 ± 0.027	0.058

<i>Crem</i>	0.313 ± 0.053	0.067	2.576 ± 0.624	0.159	2.841 ± 1.150	0.853
<i>Dact1</i>	0.502 ± 0.086	0.045	0.178 ± 0.043	0.056	0.210 ± 0.051	0.653
<i>Dlg1</i>	0.879 ± 0.159	0.580	1.064 ± 0.257	0.781	0.963 ± 0.233	0.787
<i>Fzr1</i>	0.053 ± 0.008	0.058	1.375 ± 0.334	0.831	0.057 ± 0.014	0.058
<i>Gpx3</i>	0.053 ± 0.008	0.082	0.272 ± 0.068	0.126	1.875 ± 0.718	0.154
<i>Klf5</i>	0.064 ± 0.011	0.225	0.196 ± 0.076	0.091	8.427 ± 2.707	0.093
<i>Kras</i>	0.301 ± 0.052	0.058	8.328 ± 2.016	0.037	0.068 ± 0.017	0.055
<i>Nf1</i>	0.460 ± 0.076	0.069	3.441 ± 0.833	0.153	1.085 ± 0.285	0.093
<i>Gsk3b</i>	0.054 ± 0.015	0.059	0.992 ± 0.240	0.482	0.040 ± 0.010	0.058
<i>Pdgfb</i>	0.423 ± 0.161	0.344	0.224 ± 0.054	0.750	0.349 ± 0.143	0.482
<i>Pik3r1</i>	0.129 ± 0.050	0.897	0.146 ± 0.110	0.070	2.113 ± 0.560	0.067
<i>Prdm16</i>	0.090 ± 0.014	0.067	0.830 ± 0.203	0.141	0.277 ± 0.080	0.097
<i>Prkaa2</i>	0.634 ± 0.102	0.273	0.992 ± 0.240	0.840	0.676 ± 0.163	0.345
<i>Rap1gap</i>	0.498 ± 0.161	0.214	0.215 ± 0.052	0.484	0.681 ± 0.175	0.106
<i>Robo1</i>	0.380 ± 0.061	0.136	0.874 ± 0.212	0.080	0.194 ± 0.050	0.078
<i>sin3</i>	0.224 ± 0.036	0.080	1.058 ± 0.256	0.145	0.135 ± 0.033	0.067

NAc

<i>Akt1</i>	0.087 ± 0.029	0.115	0.208 ± 0.048	0.001	1.000 ± 0.000	0.004
<i>Akt2</i>	0.035 ± 0.001	0.031	0.209 ± 0.031	0.015	0.929 ± 0.112	0.018
<i>Araf</i>	0.038 ± 0.012	0.014	1.000 ± 0.120	0.032	0.807 ± 0.143	0.362
<i>Bcr</i>	0.066 ± 0.017	0.015	0.837 ± 0.102	0.016	0.750 ± 0.093	0.564
<i>Bin1</i>	0.041 ± 0.006	0.025	0.245 ± 0.034	0.008	2.761 ± 0.241	0.008
<i>Ccnd1</i>	0.029 ± 0.010	0.017	0.357 ± 0.048	0.005	1.248 ± 0.091	0.003
<i>Crem</i>	0.065 ± 0.015	0.007	0.418 ± 0.041	0.006	0.895 ± 0.073	0.009
<i>Dact1</i>	0.073 ± 0.029	0.937	0.071 ± 0.010	0.002	1.035 ± 0.029	0.001
<i>Dlg1</i>	0.124 ± 0.022	0.058	0.280 ± 0.046	0.235	0.088 ± 0.007	0.049
<i>Fzr1</i>	0.059 ± 0.019	0.022	0.615 ± 0.090	0.443	0.083 ± 0.020	0.023
<i>Gpx3</i>	0.022 ± 0.003	0.008	0.095 ± 0.009	0.003	0.740 ± 0.042	0.003
<i>Klf5</i>	0.111 ± 0.044	0.162	0.016 ± 0.005	0.014	5.046 ± 0.588	0.013
<i>Kras</i>	0.005 ± 0.001	0.047	0.917 ± 0.205	0.015	0.057 ± 0.007	0.052
<i>Nf1</i>	0.058 ± 0.019	0.834	0.063 ± 0.010	0.002	2.116 ± 0.097	0.002
<i>Gsk3b</i>	0.057 ± 0.012	0.022	0.306 ± 0.043	0.306	0.042 ± 0.002	0.025
<i>Pdgfb</i>	0.086 ± 0.016	0.914	0.089 ± 0.027	0.006	1.180 ± 0.030	0.001
<i>Pik3r1</i>	0.068 ± 0.021	0.136	0.017 ± 0.002	0.003	0.645 ± 0.050	0.006
<i>Prdm16</i>	0.026 ± 0.006	0.011	0.118 ± 0.013	0.001	2.859 ± 0.101	0.001
<i>Prkaa2</i>	0.046 ± 0.011	0.430	0.035 ± 0.004	0.112	0.229 ± 0.068	0.104
<i>Rap1gap</i>	0.212 ± 0.082	0.157	0.031 ± 0.005	0.336	0.109 ± 0.015	0.024
<i>Robo1</i>	0.058 ± 0.014	0.035	0.240 ± 0.041	0.014	0.255 ± 0.032	0.782
<i>sin3</i>	0.085 ± 0.034	0.012	0.278 ± 0.026	0.004	0.709 ± 0.069	0.015

Hippocampus

<i>Akt1</i>	0.223 ± 0.016	0.005	0.391 ± 0.023	0.004	1.000 ± 0.000	0.001
<i>Akt2</i>	0.302 ± 0.056	0.034	1.779 ± 0.294	0.075	0.972 ± 0.208	0.096
<i>Araf</i>	0.466 ± 0.044	0.238	0.675 ± 0.128	0.130	0.807 ± 0.143	0.528
<i>Bcr</i>	0.300 ± 0.115	0.253	0.496 ± 0.089	0.041	0.750 ± 0.093	0.120

<i>Bin1</i>	1.130 ± 0.083	0.709	1.034 ± 0.217	0.014	2.355 ± 0.195	0.011
<i>Cnd1</i>	0.616 ± 0.133	0.041	2.330 ± 0.405	0.022	1.248 ± 0.091	0.110
<i>Crem</i>	0.230 ± 0.026	0.064	0.330 ± 0.029	0.006	0.895 ± 0.073	0.008
<i>Dact1</i>	0.418 ± 0.024	0.068	0.718 ± 0.089	0.001	1.035 ± 0.029	0.059
<i>Dlg1</i>	0.810 ± 0.272	0.298	0.433 ± 0.051	0.117	0.088 ± 0.007	0.020
<i>Fzr1</i>	0.260 ± 0.047	0.029	0.484 ± 0.048	0.047	0.083 ± 0.020	0.007
<i>Gpx3</i>	0.014 ± 0.001	0.018	2.703 ± 0.364	0.017	0.955 ± 0.124	0.030
<i>Klf5</i>	0.300 ± 0.092	0.021	0.948 ± 0.135	0.013	5.046 ± 0.588	0.016
<i>Kras</i>	0.443 ± 0.036	0.701	0.409 ± 0.072	0.007	0.057 ± 0.007	0.039
<i>Nf1</i>	1.194 ± 0.131	0.061	0.755 ± 0.102	0.006	2.116 ± 0.097	0.001
<i>Gsk3b</i>	0.257 ± 0.118	0.071	0.725 ± 0.147	0.208	0.042 ± 0.002	0.044
<i>Pdgfb</i>	0.125 ± 0.052	0.015	0.945 ± 0.132	0.003	1.180 ± 0.030	0.211
<i>Pik3r1</i>	0.193 ± 0.084	0.176	3.012 ± 1.371	0.016	0.645 ± 0.050	0.226
<i>Prdm16</i>	0.241 ± 0.017	0.079	0.830 ± 0.178	0.001	2.859 ± 0.101	0.002
<i>Prkaa2</i>	0.035 ± 0.006	0.017	1.197 ± 0.155	0.050	0.095 ± 0.016	0.018
<i>Rap1gap</i>	0.347 ± 0.019	0.042	0.787 ± 0.098	0.001	0.109 ± 0.015	0.018
<i>Robo1</i>	0.038 ± 0.002	0.012	1.537 ± 0.164	0.021	0.255 ± 0.032	0.013
<i>sin3</i>	0.044 ± 0.004	0.012	0.763 ± 0.081	0.010	0.709 ± 0.069	0.639

Hypothalamus

<i>Akt1</i>	0.722 ± 0.054	0.210	0.608 ± 0.054	0.035	1.000 ± 0.000	0.018
<i>Akt2</i>	0.247 ± 0.024	0.082	0.789 ± 0.169	0.076	0.870 ± 0.186	0.765
<i>Araf</i>	0.305 ± 0.034	0.273	0.499 ± 0.131	0.074	0.723 ± 0.128	0.289
<i>Bcr</i>	0.578 ± 0.149	0.865	0.609 ± 0.075	0.621	0.671 ± 0.083	0.610
<i>Bin1</i>	0.113 ± 0.008	0.013	0.280 ± 0.024	0.008	2.471 ± 0.216	0.009
<i>Cnd1</i>	0.210 ± 0.007	0.190	0.753 ± 0.278	0.008	1.117 ± 0.082	0.319
<i>Crem</i>	0.498 ± 0.061	0.526	0.612 ± 0.145	0.027	0.801 ± 0.065	0.326
<i>Dact1</i>	0.519 ± 0.189	0.722	0.627 ± 0.210	0.163	0.926 ± 0.026	0.289
<i>Dlg1</i>	0.648 ± 0.068	0.010	0.072 ± 0.017	0.013	0.079 ± 0.006	0.744
<i>Fzr1</i>	0.181 ± 0.057	0.177	0.067 ± 0.016	0.195	0.074 ± 0.018	0.792
<i>Gpx3</i>	0.011 ± 0.002	0.017	0.776 ± 0.101	0.017	0.855 ± 0.111	0.627
<i>Klf5</i>	0.461 ± 0.032	0.004	0.064 ± 0.007	0.016	4.516 ± 0.526	0.014
<i>Kras</i>	0.259 ± 0.040	0.032	0.046 ± 0.006	0.033	0.051 ± 0.006	0.602
<i>Nf1</i>	0.473 ± 0.035	0.001	1.719 ± 0.079	0.001	1.894 ± 0.087	0.210
<i>Gsk3b</i>	0.216 ± 0.017	0.003	0.044 ± 0.009	0.001	0.569 ± 0.010	0.000
<i>Pdgfb</i>	0.921 ± 0.082	0.009	0.060 ± 0.002	0.237	1.056 ± 0.027	0.001
<i>Pik3r1</i>	0.037 ± 0.019	0.002	0.524 ± 0.040	0.002	0.578 ± 0.045	0.425
<i>Prdm16</i>	0.253 ± 0.042	0.185	0.395 ± 0.073	0.001	2.559 ± 0.091	0.001
<i>Prkaa2</i>	0.123 ± 0.022	0.033	0.007 ± 0.001	0.036	0.268 ± 0.036	0.019
<i>Rap1gap</i>	0.565 ± 0.079	0.024	0.089 ± 0.012	0.024	0.098 ± 0.013	0.636
<i>Robo1</i>	0.354 ± 0.113	0.322	0.207 ± 0.026	0.382	0.229 ± 0.029	0.617
<i>sin3</i>	0.060 ± 0.007	0.011	0.576 ± 0.056	0.011	0.634 ± 0.062	0.519

Striatum

<i>Akt1</i>	3.303 ± 0.322	0.018	1.246 ± 0.087	0.019	1.000 ± 0.000	0.106
<i>Akt2</i>	0.168 ± 0.010	0.173	0.237 ± 0.034	0.145	0.868 ± 0.300	0.169

<i>Araf</i>	1.261 ± 0.219	0.046	5.464 ± 0.994	0.170	0.807 ± 0.143	0.040
<i>Bcr</i>	3.793 ± 0.294	0.006	0.080 ± 0.009	0.005	0.750 ± 0.093	0.018
<i>Bin1</i>	2.073 ± 0.351	0.046	0.585 ± 0.077	0.697	2.375 ± 0.615	0.098
<i>Cend1</i>	2.341 ± 0.133	0.034	9.280 ± 1.332	0.004	1.248 ± 0.091	0.026
<i>Crem</i>	0.957 ± 0.120	0.166	3.778 ± 1.325	0.689	0.895 ± 0.073	0.161
<i>Dact1</i>	0.502 ± 0.008	0.033	2.225 ± 0.324	0.002	1.035 ± 0.029	0.066
<i>Dlg1</i>	1.742 ± 0.186	0.890	1.796 ± 0.312	0.012	0.088 ± 0.007	0.032
<i>Fzr1</i>	0.340 ± 0.036	0.026	2.399 ± 0.349	0.008	0.083 ± 0.020	0.022
<i>Gpx3</i>	1.442 ± 0.146	0.019	2.979 ± 0.290	0.065	0.955 ± 0.124	0.010
<i>Klf5</i>	0.529 ± 0.098	0.040	0.059 ± 0.008	0.015	5.046 ± 0.588	0.014
<i>Kras</i>	1.161 ± 0.065	0.111	2.692 ± 0.563	0.003	0.057 ± 0.007	0.043
<i>Nf1</i>	2.639 ± 0.247	0.060	7.526 ± 1.308	0.157	2.116 ± 0.097	0.053
<i>Gsk3b</i>	0.426 ± 0.034	0.033	1.959 ± 0.293	0.008	0.042 ± 0.002	0.023
<i>Pdgfb</i>	1.011 ± 0.072	0.675	0.898 ± 0.227	0.009	0.295 ± 0.008	0.117
<i>Pik3r1</i>	0.510 ± 0.253	0.018	2.554 ± 0.404	0.647	0.645 ± 0.050	0.040
<i>Prdm16</i>	1.944 ± 0.253	0.031	0.754 ± 0.090	0.053	2.859 ± 0.101	0.001
<i>Prkaa2</i>	0.774 ± 0.578	0.443	0.226 ± 0.024	0.723	0.537 ± 0.090	0.066
<i>Rap1gap</i>	2.325 ± 0.240	0.114	1.587 ± 0.273	0.012	0.436 ± 0.058	0.047
<i>Robo1</i>	3.544 ± 0.475	0.032	1.539 ± 0.277	0.020	0.255 ± 0.032	0.042
<i>sin3</i>	0.180 ± 0.014	0.011	1.780 ± 0.173	0.014	0.709 ± 0.069	0.015

Table S2. Pathways analysis for selected candidate genes

KEGG Pathway	N	P-Value	Genes involved
Glioma	15	5.05E-23	<i>BRAF, PDGFB, CDK6, AKT1, NRAS, IGF1R, CCND1, KRAS, ARAF, PDGFRA, MDM2, PDGFRB, PIK3CA, PIK3R1, AKT2</i>
Melanoma	15	2.45E-22	<i>BRAF, PDGFB, CDK6, AKT1, NRAS, IGF1R, CCND1, KRAS, ARAF, PDGFRA, MDM2, PDGFRB, PIK3CA, PIK3R1, AKT2</i>
Prostate cancer	15	3.63E-21	<i>BRAF, PDGFB, AKT1, NRAS, IGF1R, CCND1, KRAS, GSK3B, ARAF, PDGFRA, MDM2, PDGFRB, PIK3CA, PIK3R1, AKT2</i>
Chronic myeloid leukemia	12	3.60E-16	<i>AKT1, NRAS, CCND1, BCR, KRAS, BRAF, ARAF, PIK3CA, MDM2, CDK6, PIK3R1, AKT2</i>
Pathways in cancer	17	2.02E-14	<i>BCR, BRAF, PDGFB, CDK6, AKT1, NRAS, IGF1R, CCND1, KRAS, GSK3B, ARAF, PDGFRA, PIK3CA, MDM2, PDGFRB, PIK3R1, AKT2</i>
Endometrial cancer	10	5.95E-14	<i>AKT1, NRAS, CCND1, KRAS, BRAF, GSK3B, ARAF, PIK3CA, PIK3R1, AKT2</i>
Non-small cell lung cancer	10	1.47E-13	<i>AKT1, NRAS, CCND1, KRAS, BRAF, ARAF, PIK3CA, CDK6, PIK3R1, AKT2</i>
FoxO signaling pathway	12	3.15E-13	<i>AKT1, IGF1R, NRAS, CCND1, KRAS, BRAF, ARAF, PIK3CA, MDM2, PRKAA2, PIK3R1, AKT2</i>
PI3K-Akt signaling pathway	15	1.69E-12	<i>AKT1, IGF1R, NRAS, CCND1, KRAS, PDGFB, GSK3B, PDGFRA, PIK3CA, PDGFRB, MDM2, CDK6, PRKAA2, PIK3R1, AKT2</i>
Acute myeloid leukemia	9	1.09E-11	<i>AKT1, NRAS, CCND1, KRAS, BRAF, ARAF, PIK3CA, PIK3R1, AKT2</i>
HTLV-I infection	13	3.25E-11	<i>AKT1, NRAS, CCND1, KRAS, PDGFB, CREM, GSK3B, PDGFRA, PIK3CA, PDGFRB, PIK3R1, DLG1, AKT2</i>
Pancreatic cancer	9	3.78E-11	<i>AKT1, CCND1, KRAS, BRAF, ARAF, PIK3CA, CDK6, PIK3R1, AKT2</i>
Colorectal cancer	9	4.29E-11	<i>AKT1, CCND1, KRAS, BRAF, GSK3B, ARAF, PIK3CA, PIK3R1, AKT2</i>
Renal cell carcinoma	9	4.29E-11	<i>AKT1, NRAS, KRAS, BRAF, PDGFB, ARAF, PIK3CA, PIK3R1, AKT2</i>
Rap1 signaling pathway	12	6.43E-11	<i>AKT1, IGF1R, NRAS, KRAS, BRAF, RAPIGAP, PDGFB, PDGFRA, PIK3CA, PDGFRB, PIK3R1, AKT2</i>
ErbB signaling pathway	9	3.79E-10	<i>AKT1, NRAS, KRAS, BRAF, GSK3B, ARAF, PIK3CA, PIK3R1, AKT2</i>
Progesterone-mediated oocyte maturation	9	4.57E-10	<i>AKT1, IGF1R, FZRI, KRAS, BRAF, ARAF, PIK3CA, PIK3R1, AKT2</i>
Insulin signaling pathway	10	5.45E-10	<i>AKT1, NRAS, KRAS, BRAF, GSK3B, ARAF, PIK3CA, PRKAA2, PIK3R1, AKT2</i>
Proteoglycans in cancer	11	8.97E-10	<i>AKT1, IGF1R, NRAS, CCND1, KRAS, BRAF, ARAF, PIK3CA, MDM2, PIK3R1, AKT2</i>
Focal adhesion	11	1.14E-09	<i>AKT1, IGF1R, CCND1, BRAF, PDGFB, GSK3B, PDGFRA, PIK3CA, PDGFRB, PIK3R1, AKT2</i>
Choline metabolism in cancer	9	1.19E-09	<i>AKT1, NRAS, KRAS, PDGFB, PDGFRA, PIK3CA, PDGFRB, PIK3R1, AKT2</i>

Central carbon metabolism in cancer	8	1.39E-09	<i>AKT1, NRAS, KRAS, PDGFRA, PIK3CA, PDGFRB, PIK3R1, AKT2</i>
Thyroid hormone signaling pathway	9	3.44E-09	<i>AKT1, NRAS, CCND1, KRAS, GSK3B, PIK3CA, MDM2, PIK3R1, AKT2</i>
Ras signaling pathway	11	3.74E-09	<i>AKT1, IGF1R, NRAS, KRAS, PDGFB, NF1, PDGFRA, PIK3CA, PDGFRB, PIK3R1, AKT2</i>
Prolactin signaling pathway	8	4.94E-09	<i>AKT1, NRAS, CCND1, KRAS, GSK3B, PIK3CA, PIK3R1, AKT2</i>
Hepatitis C	9	1.26E-08	<i>AKT1, NRAS, KRAS, BRAF, GSK3B, ARAF, PIK3CA, PIK3R1, AKT2</i>
T cell receptor signaling pathway	8	5.81E-08	<i>AKT1, NRAS, KRAS, GSK3B, PIK3CA, PIK3R1, AKT2, DLG1</i>
B cell receptor signaling pathway	7	1.30E-07	<i>AKT1, NRAS, KRAS, GSK3B, PIK3CA, PIK3R1, AKT2</i>
Neurotrophin signaling pathway	8	1.94E-07	<i>AKT1, NRAS, KRAS, BRAF, GSK3B, PIK3CA, PIK3R1, AKT2</i>
Bladder cancer	6	2.39E-07	<i>NRAS, CCND1, KRAS, BRAF, ARAF, MDM2</i>
Signaling pathways regulating pluripotency of stem cells	8	4.02E-07	<i>AKT1, IGF1R, NRAS, KRAS, GSK3B, PIK3CA, PIK3R1, AKT2</i>
Regulation of actin cytoskeleton	9	4.75E-07	<i>NRAS, KRAS, BRAF, PDGFB, ARAF, PDGFRA, PIK3CA, PDGFRB, PIK3R1</i>
Hepatitis B	8	6.17E-07	<i>AKT1, NRAS, CCND1, KRAS, PIK3CA, CDK6, PIK3R1, AKT2</i>
mTOR signaling pathway	6	1.74E-06	<i>AKT1, BRAF, PIK3CA, PRKAA2, PIK3R1, AKT2</i>
VEGF signaling pathway	6	1.74E-06	<i>AKT1, NRAS, KRAS, PIK3CA, PIK3R1, AKT2</i>
MAPK signaling pathway	9	1.93E-06	<i>AKT1, NRAS, KRAS, BRAF, PDGFB, NF1, PDGFRA, PDGFRB, AKT2</i>
Chemokine signaling pathway	8	2.78E-06	<i>AKT1, NRAS, KRAS, BRAF, GSK3B, PIK3CA, PIK3R1, AKT2</i>
AMPK signaling pathway	7	3.20E-06	<i>AKT1, IGF1R, CCND1, PIK3CA, PRKAA2, PIK3R1, AKT2</i>
Fc epsilon RI signaling pathway	6	3.28E-06	<i>AKT1, NRAS, KRAS, PIK3CA, PIK3R1, AKT2</i>
Measles	7	7.84E-06	<i>AKT1, CCND1, GSK3B, PIK3CA, CDK6, PIK3R1, AKT2</i>
Small cell lung cancer	6	1.20E-05	<i>AKT1, CCND1, PIK3CA, CDK6, PIK3R1, AKT2</i>
Viral carcinogenesis	8	1.31E-05	<i>NRAS, CCND1, KRAS, PIK3CA, MDM2, CDK6, PIK3R1, DLG1</i>
MicroRNAs in cancer	8	1.92E-05	<i>NRAS, CCND1, KRAS, PDGFB, PDGFRA, PDGFRB, MDM2, CDK6</i>
Estrogen signaling pathway	6	2.14E-05	<i>AKT1, NRAS, KRAS, PIK3CA, PIK3R1, AKT2</i>
Cholinergic synapse	6	3.75E-05	<i>AKT1, NRAS, KRAS, PIK3CA, PIK3R1, AKT2</i>
Insulin resistance	6	3.91E-05	<i>AKT1, GSK3B, PIK3CA, PRKAA2, PIK3R1, AKT2</i>
Natural killer cell mediated	6	5.04E-05	<i>NRAS, KRAS, BRAF, ARAF, PIK3CA, PIK3R1</i>

cytotoxicity

Long-term depression	5	5.16E-05	<i>IGF1R, NRAS, KRAS, BRAF, ARAF</i>
Sphingolipid signaling pathway	6	5.69E-05	<i>AKT1, NRAS, KRAS, PIK3CA, PIK3R1, AKT2</i>
Thyroid cancer	4	1.72E-04	<i>NRAS, CCND1, KRAS, BRAF</i>
Fc gamma R-mediated phagocytosis	5	2.16E-04	<i>AKT1, PIK3CA, BIN1, PIK3R1, AKT2</i>
Non-alcoholic fatty liver disease (NAFLD)	6	2.22E-04	<i>AKT1, GSK3B, PIK3CA, PRKAA2, PIK3R1, AKT2</i>
Gap junction	5	2.57E-04	<i>NRAS, KRAS, PDGFB, PDGFRA, PDGFRB</i>
HIF-1 signaling pathway	5	3.44E-04	<i>AKT1, IGF1R, PIK3CA, PIK3R1, AKT2</i>
Carbohydrate digestion and absorption	4	3.97E-04	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Epstein-Barr virus infection	5	7.54E-04	<i>AKT1, PIK3CA, MDM2, PIK3R1, AKT2</i>
Axon guidance	5	9.36E-04	<i>NRAS, KRAS, ROBO1, GSK3B, SRGAP3</i>
Cell cycle	5	9.36E-04	<i>CCND1, FZR1, GSK3B, MDM2, CDK6</i>
Regulation of lipolysis in adipocytes	4	9.45E-04	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Apoptosis	4	0.00134	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Long-term potentiation	4	0.001537	<i>NRAS, KRAS, BRAF, ARAF</i>
Jak-STAT signaling pathway	5	0.001886	<i>AKT1, CCND1, PIK3CA, PIK3R1, AKT2</i>
Influenza A	5	0.003095	<i>AKT1, GSK3B, PIK3CA, PIK3R1, AKT2</i>
cAMP signaling pathway	5	0.005018	<i>AKT1, BRAF, PIK3CA, PIK3R1, AKT2</i>
Toll-like receptor signaling pathway	4	0.005999	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
TNF signaling pathway	4	0.006487	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Chagas disease (American trypanosomiasis)	4	0.007532	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Serotonergic synapse	4	0.007902	<i>NRAS, KRAS, BRAF, ARAF</i>
Aldosterone-regulated sodium reabsorption	3	0.008412	<i>KRAS, PIK3CA, PIK3R1</i>

Platelet activation	4	0.010126	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Osteoclast differentiation	4	0.011713	<i>AKT1, PIK3CA, PIK3R1, AKT2</i>
Oxytocin signaling pathway	4	0.014484	<i>NRAS, CCND1, KRAS, PRKAA2</i>
Adipocytokine signaling pathway	3	0.026303	<i>AKT1, PRKAA2, AKT2</i>
p53 signaling pathway	3	0.026303	<i>CCND1, MDM2, CDK6</i>
Alcoholism	4	0.040302	<i>NRAS, KRAS, BRAF, ARAF</i>
Glucagon signaling pathway	3	0.044854	<i>AKT1, PRKAA2, AKT2</i>
Melanogenesis	3	0.04831	<i>NRAS, KRAS, GSK3B</i>
Endocytosis	4	0.05457	<i>IGF1R, PDGFRA, MDM2, BIN1</i>
Dopaminergic synapse	3	0.076022	<i>AKT1, GSK3B, AKT2</i>
Adrenergic signaling in cardiomyocytes	3	0.084393	<i>AKT1, CREM, AKT2</i>
Ubiquitin mediated proteolysis	3	0.084393	<i>FZR1, MDM2, PARK2</i>

Table S3. List of genes selected for phylogenetic and KEGG analysis

Oncogenes	Tumor suppressor genes
<p><i>Abl1, Abl2, Akt1, Akt2, Birc3, Araf, Rhoa, Bax, Ccnd1, Bcl3, Bcl9, Bcr, Braf, Runx1, Cbl, Cdc25c, Cdh17, Klf6, Creb1, Csf1r, Csf3r, Cux1, Ddx6, Eph2, Elf4, Erbb2, Erbb3, Erbb4, Erg, Ewsr1, Fgfr1, Fgfr2, Fgfr4, Foxm1, Foxo1, Gata1, Gli1, Gli3, Gnai2, Gnaq, Grm1, Hlf, Hmgal, Idh1, Igf1r, Eif3e, Irf2, Irf4, Itk, Jak1, Jak2, Jun, Kit, Kras, Lck, Lmo2, Mcl1, Mdm2, Mef2c, Met, Mitf, Mllt1, Mpl, Myb, Mycn, Nedd4, Nfib, Nfkb2, Notch1, Npm1, Nras, Nup98, Pax2, Pdgfb, Pdgfra, Pdgfrb, Pik3ca, Pim1, Pik3r1, Plag1, Pml, Ppp2r1a, Ptpn11, Ralgds, Rara, Rel, Ros1, Set, Stil, Ski, Src, Ss18, Syk, Tall1, Tcf3, Tfe3, Tle1, Tmprss2, Tpr, Trio, Vav1, Zmym2, Pax8, Dek, Nup214, Ccdc6, Ncoa4, Yeats4, Hmga2, Ell, Ncoa3, Ppm1d, Fubp1, Ccnb2, Espl1, Akap9, Ikzf1, Tfg, Malt1, Fgfr1op, Psip1, Crtcl, Brd4, Suz12, Wwtr1, Foxp1, Eml4, Zbtb7a, Gopc, Prdm16, Aspser1, Card11</i></p>	<p><i>Per2, Erf, Ccdc136, Crem, Zfp36, Arntl, Cdkn1a, Dph1, Dcun1d3, Rasl10a, Rassf1, Nr4a1, Cxxc4, Npas2, Chd1, Dclre1a, Srgap3, Atf3, Smarca2, Ptch2, Notch2, Cldn1, Rap1gap, Lima1, Prdm5, Robo1, Plk2, SrpX, Klf5, Mapk10, Sox15, Marveld1, Bin1, Lsamp, Tspan32, Hltf, Bcr, Sall2, Prkaa2, Blnk, Gli1, Park2, Ptgdr, Rbbp7, Dact1, Cdk6, Fzr1, Cxcl14, Lrig3, Gpx3, Gsk3b, Hspd1, Nf1, Fbxw7, Samd9l, Dicer1, Map4k1, Bmpr1a, Dlg1, Nfatc2, Ppp2r5c, Llgl1, Ing4, Gnb2l1, Sfrp2, Dkk3, Hic1, Abi2</i></p>

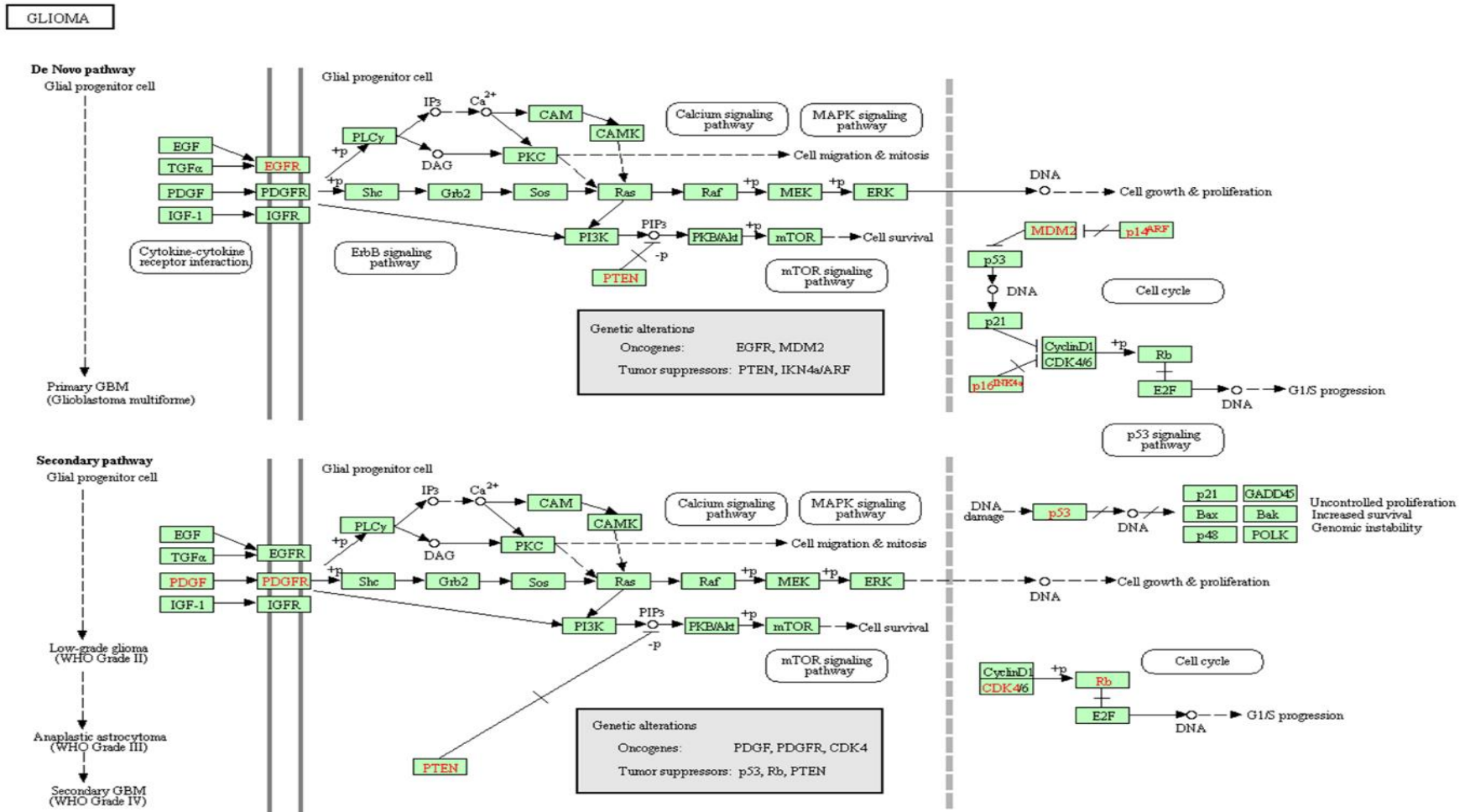


Figure S1. KEGG analysis of the selected genes revealed that a high percentage of the selected genes was associated with glioma pathway.

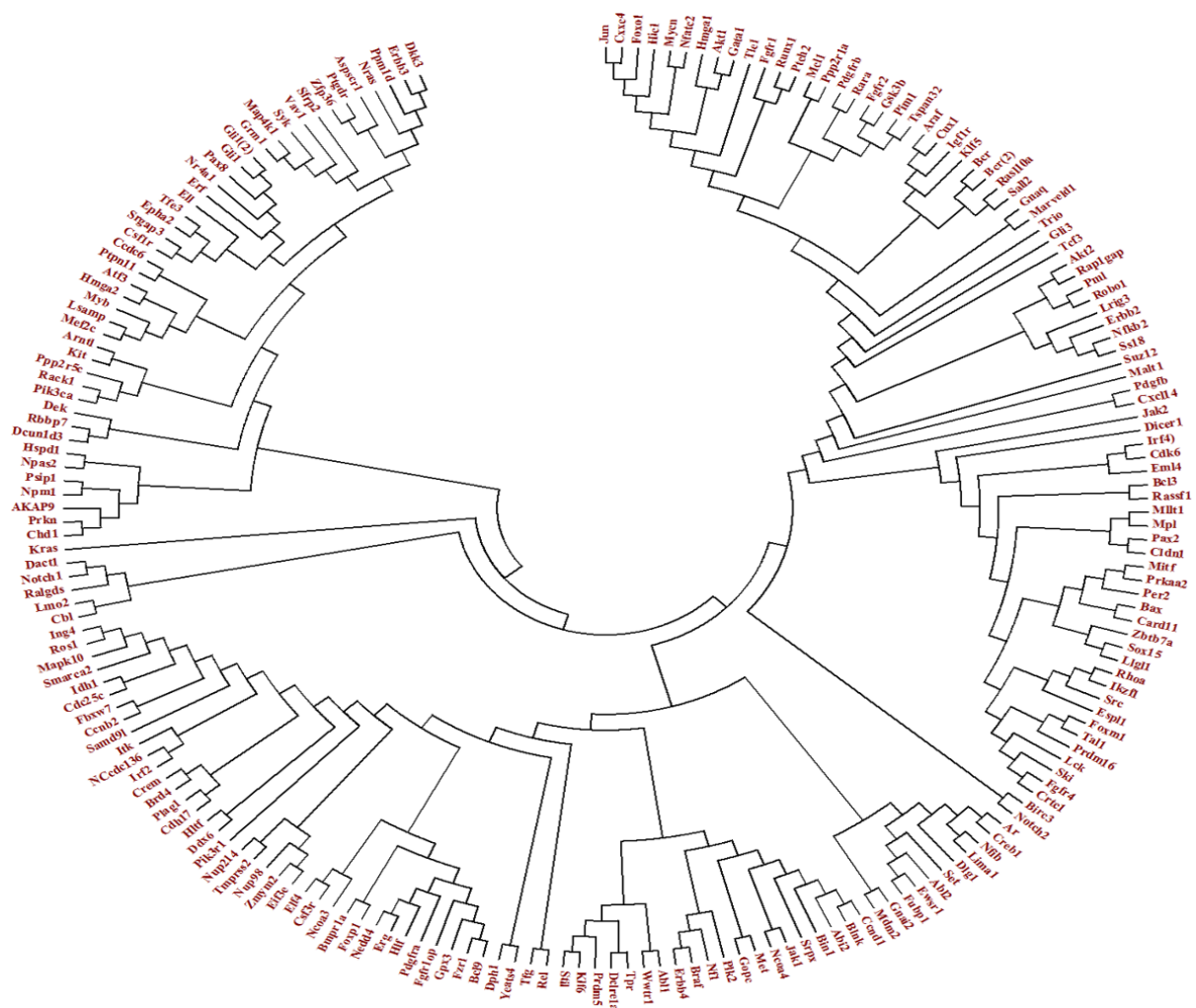


Figure S2. Phylogenetic tree for the selected 201 genes. These genes were found common in all the databases. The closely related genes were further analyzed.

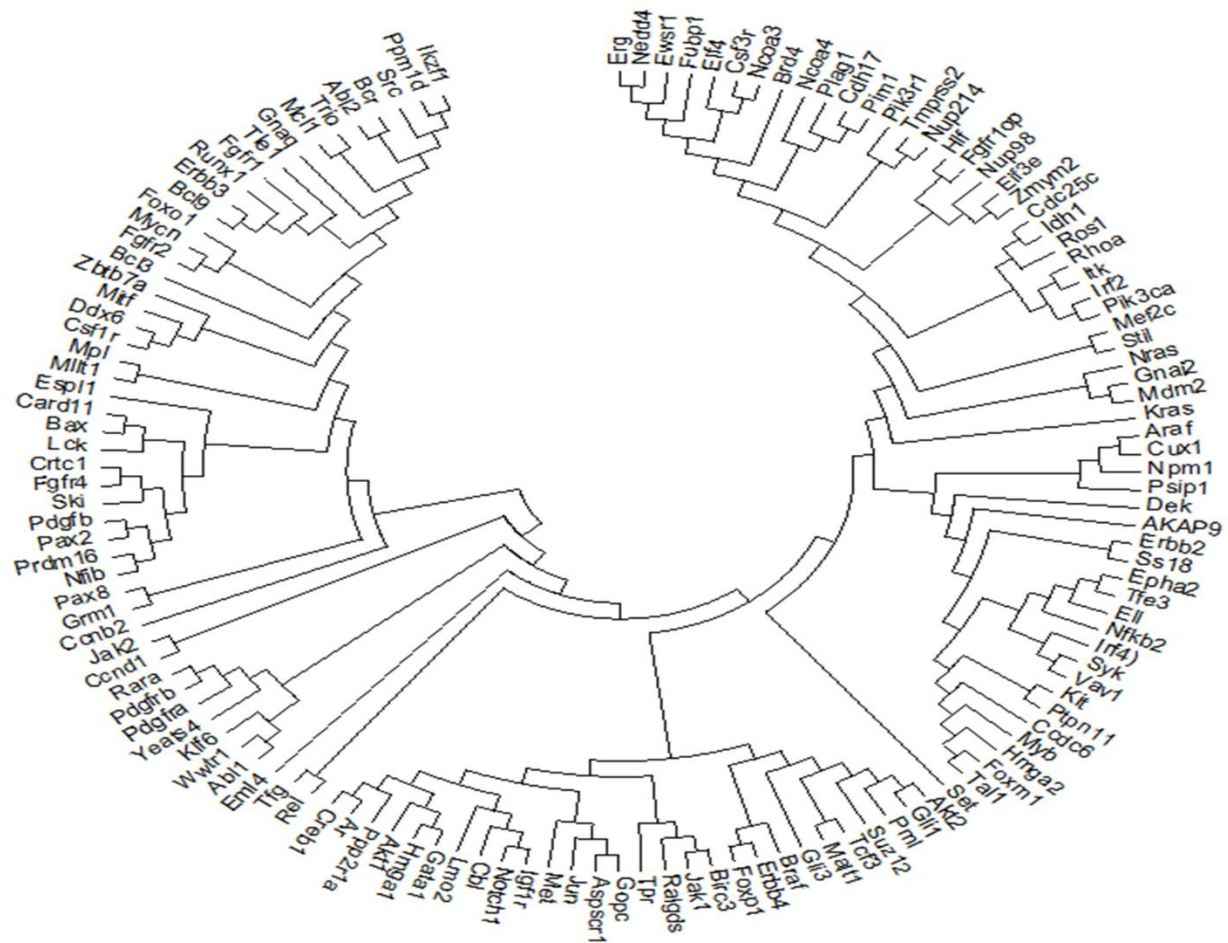


Figure S3. Phylogenetic analysis for the selected 133 oncogenes. These genes were found common in all the databases. The closely related genes were further analyzed.

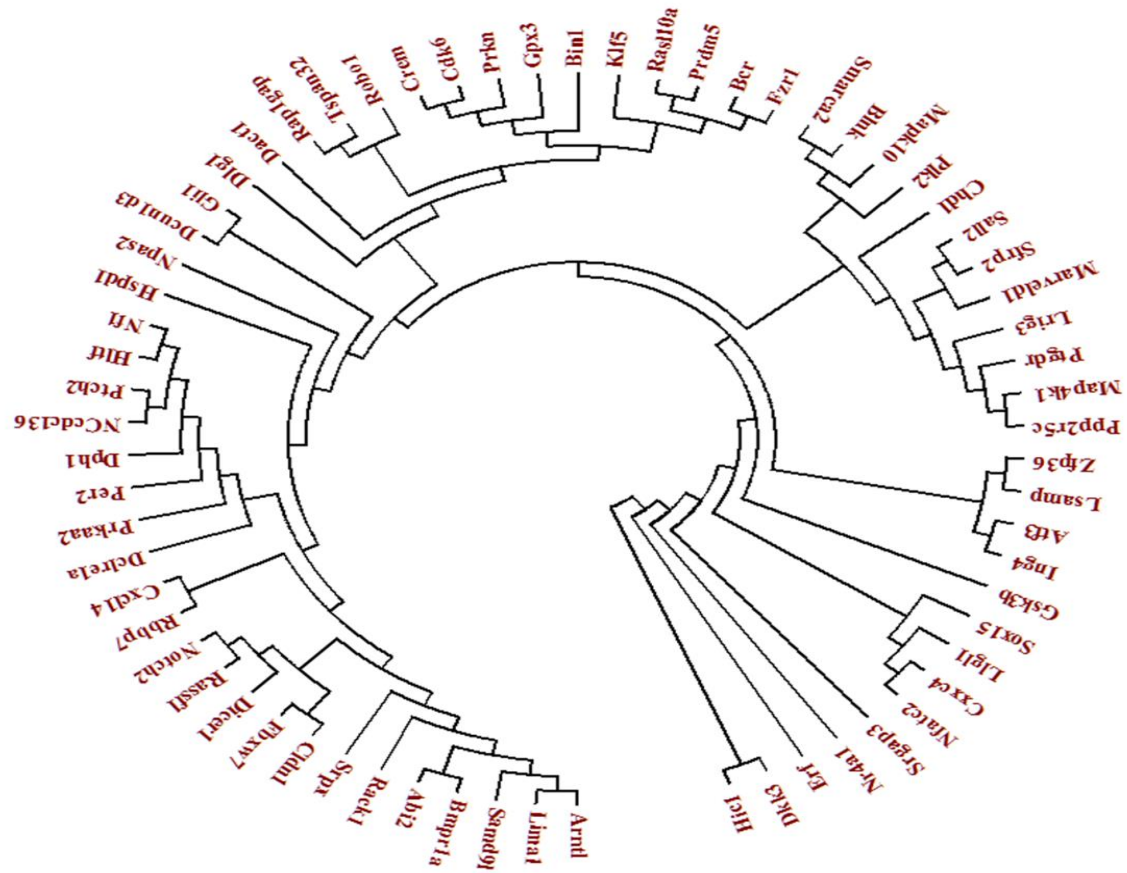


Figure S4. Phylogenetic tree for the selected 68 tumor suppressor genes. These genes were found common in all the databases. The closely related genes were further analyzed.