**Supplementary Table 1.** Samples from the GEO dataset GSE193391 that are considered for our study.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Control Samples** | | | | |
| **Accession** | **Age** | **Sex** | **Race** | **APOE status** |
| GSM5799484 | 52 | Female | White | E3/4 |
| GSM5799495 | 59 | Male | Black | E2/3 |
| GSM5799498 | 57 | Male | White | E3/3 |
| GSM5799485 | 78 | Female | White | E3/3 |
| GSM5799504 | 56 | Male | White | NA |
| GSM5799489 | 70 | Male | Black | E3/3 |
| GSM5799493 | 75 | Female | White | E3/3 |
| GSM5799506 | 74 | Female | White | E3/3 |
| **FTD Samples** | | | | |
| **Accession** | **Age** | **Sex** | **Race** | **APOE status** |
| GSM5799499 | 81 | Male | White | E3/3 |
| GSM5799500 | 60 | Female | White | E3/4 |
| GSM5799501 | 64 | Male | White | E3/4 |
| GSM5799488 | 71 | Male | White | NA |
| GSM5799505 | 56 | Female | White | NA |
| GSM5799490 | 65 | Female | White | E2/3 |
| GSM5799492 | 65 | Female | White | NA |
| GSM5799494 | 63 | Male | White | E3/3 |

**Supplementary Table 2.** List of genes that are differentially expressed between control and FTD samples from African American and white ethnic background

|  |  |  |
| --- | --- | --- |
| **ID** | **log2(fold change)** | **Log10(Pvalue)** |
| RAB3A - mRNA | 1.915144402 | 3.77847022 |
| NEFL - mRNA | 1.897532002 | 2.733218677 |
| KCNV1 - mRNA | 1.885089293 | 2.719638972 |
| BDNF - mRNA | 1.866737397 | 3.591163588 |
| YWHAH - mRNA | 1.6608987 | 2.405732385 |
| GABRG2 - mRNA | 1.628626591 | 2.853410941 |
| SH3GL2 - mRNA | 1.583076732 | 2.06976279 |
| SYN2 - mRNA | 1.57975656 | 2.906948704 |
| RIMS1 - mRNA | 1.568248876 | 4.093696854 |
| PAK1 - mRNA | 1.536618015 | 3.345044705 |
| LRRC7 - mRNA | 1.483228062 | 2.949637769 |
| OLFM3 - mRNA | 1.478048842 | 2.196272335 |
| NSF - mRNA | 1.470471918 | 2.8267357 |
| SYT4 - mRNA | 1.463409341 | 2.047512958 |
| RTN1 - mRNA | 1.424424538 | 2.802983479 |
| SNAP25 - mRNA | 1.421016388 | 1.947949038 |
| PTK2B - mRNA | 1.410402443 | 3.341846011 |
| NAP1L2 - mRNA | 1.403716046 | 1.904585667 |
| EGR1 - mRNA | 1.384945572 | 2.389110077 |
| CAMK2A - mRNA | 1.378496175 | 3.43386502 |
| NUAK1 - mRNA | 1.369764371 | 3.644423765 |
| GNG2 - mRNA | 1.357187146 | 3.320099298 |
| GOT1 - mRNA | 1.325792453 | 2.378155293 |
| INPP5F - mRNA | 1.305575319 | 3.243018577 |
| WASF1 - mRNA | 1.301920962 | 1.892321479 |
| PPP3R1 - mRNA | 1.30075068 | 2.529676746 |
| STXBP1 - mRNA | 1.300095155 | 3.621653783 |
| GABRA4 - mRNA | 1.219070941 | 4.509554079 |
| DNM1 - mRNA | 1.201255269 | 2.352457955 |
| GLRB - mRNA | 1.200900947 | 2.215614688 |
| ATP6V1A - mRNA | 1.196505702 | 3.115400512 |
| ATP1B1 - mRNA | 1.193819927 | 2.031703794 |
| GLRA3 - mRNA | 1.183966166 | 3.092616856 |
| KCNQ3 - mRNA | 1.179882463 | 3.412678642 |
| CHN1 - mRNA | 1.174702891 | 2.544797267 |
| CAMK4 - mRNA | 1.173708395 | 3.232712429 |
| RTN4 - mRNA | 1.15831902 | 4.394279735 |
| ATP8A2 - mRNA | 1.14966702 | 2.950537222 |
| SCN8A - mRNA | 1.146906285 | 2.008116859 |
| GABRB3 - mRNA | 1.145156702 | 2.87116907 |
| SLC9A6 - mRNA | 1.131125193 | 2.361239462 |
| RAB6B - mRNA | 1.126458729 | 3.474648238 |
| ADAM22 - mRNA | 1.116226691 | 2.356014975 |
| OPCML - mRNA | 1.107954773 | 2.135919814 |
| MAPK9 - mRNA | 1.103027034 | 4.643847565 |
| GAS7 - mRNA | 1.076166641 | 4.123247843 |
| GABRD - mRNA | 1.076020515 | 3.117773673 |
| GNG3 - mRNA | 1.0698848 | 1.987961021 |
| ELOC - mRNA | 1.064341266 | 4.247940241 |
| DLGAP1 - mRNA | 1.058353261 | 2.472027972 |
| SCOC - mRNA | 1.055877723 | 2.578757727 |
| CHRM3 - mRNA | 1.042085502 | 2.447089994 |
| GRIA3 - mRNA | 1.035749257 | 3.037924991 |
| GPRASP1 - mRNA | 1.033593913 | 2.287202604 |
| EPB41L3 - mRNA | 1.031961645 | 2.467957958 |
| VDAC3 - mRNA | 1.030329792 | 3.060049353 |
| CD200 - mRNA | 1.025489227 | 2.450437883 |
| TSPAN7 - mRNA | 1.00912407 | 2.571620596 |
| ATP6V1B2 - mRNA | 1.007374069 | 2.305591583 |
| GRM7 - mRNA | 1.003906517 | 3.22158249 |
| NPTN - mRNA | 0.986291875 | 2.878055769 |
| SYN1 - mRNA | 0.96976014 | 2.070087775 |
| ELMO1 - mRNA | 0.966630928 | 2.077737383 |
| VDAC1 - mRNA | 0.965119399 | 4.443380835 |
| RASGRF1 - mRNA | 0.962469575 | 3.04267522 |
| DCLK1 - mRNA | 0.962464282 | 1.797943437 |
| SHC3 - mRNA | 0.961235177 | 3.433607734 |
| ACSL4 - mRNA | 0.959394811 | 3.80475451 |
| ATP6V1C1 - mRNA | 0.948824655 | 2.490877896 |
| DNAJC5 - mRNA | 0.943238687 | 3.72288062 |
| ATP1A1 - mRNA | 0.935891012 | 1.985968873 |
| THY1 - mRNA | 0.923503371 | 2.192981444 |
| CUX2 - mRNA | 0.913827343 | 2.155251033 |
| MAL2 - mRNA | 0.902747239 | 1.990336016 |
| CDK5R1 - mRNA | 0.888240135 | 3.108818381 |
| AKT3 - mRNA | 0.882159071 | 5.067588548 |
| NDUFB5 - mRNA | 0.88202676 | 2.462037282 |
| CCNA1 - mRNA | 0.874553085 | 3.660615382 |
| ERLEC1 - mRNA | 0.870932918 | 2.056460252 |
| GPM6A - mRNA | 0.859561301 | 2.347365339 |
| NCAN - mRNA | 0.859469661 | 2.038926235 |
| TNFRSF11A - mRNA | 0.853762528 | 3.599233881 |
| PRKACB - mRNA | 0.838274822 | 2.353137015 |
| CD47 - mRNA | 0.838044401 | 2.324197232 |
| CHRNB2 - mRNA | 0.82749162 | 1.863484769 |
| TUSC3 - mRNA | 0.826263872 | 1.713636951 |
| GLS - mRNA | 0.814156846 | 2.259348658 |
| PPP2CA - mRNA | 0.812230706 | 3.383232914 |
| GRIN2A - mRNA | 0.810991331 | 1.783510405 |
| MAP2K4 - mRNA | 0.809194743 | 2.996969002 |
| RORB - mRNA | 0.802570777 | 1.992757562 |
| ATP6V0D1 - mRNA | 0.783279941 | 3.003200326 |
| ZNF365 - mRNA | 0.782645652 | 1.805601788 |
| YWHAZ - mRNA | 0.767980763 | 1.884538749 |
| LGMN - mRNA | 0.767724646 | 2.675968969 |
| UBE2N - mRNA | 0.766382926 | 4.269228862 |
| NLK - mRNA | 0.765657757 | 2.327488828 |
| CYFIP2 - mRNA | 0.763266633 | 2.544689517 |
| TANC2 - mRNA | 0.751802158 | 2.74408857 |
| PRKCZ - mRNA | 0.74386205 | 1.957067863 |
| ATP6V1E1 - mRNA | 0.71899494 | 1.787761678 |
| ATP5MC3 - mRNA | 0.716880176 | 2.742671217 |
| ARPC5L - mRNA | 0.715565935 | 2.296888637 |
| HK1 - mRNA | 0.714724418 | 3.933186341 |
| FGF13 - mRNA | 0.707558202 | 1.780608037 |
| NRCAM - mRNA | 0.699394099 | 3.613846441 |
| DNAJA2 - mRNA | 0.696784447 | 2.085295738 |
| SEC61A2 - mRNA | 0.6852858 | 2.711823267 |
| BASP1 - mRNA | 0.68366809 | 2.132921611 |
| HSP90AB1 - mRNA | 0.683387239 | 2.701011871 |
| DLAT - mRNA | 0.682127404 | 2.906699187 |
| OPA1 - mRNA | 0.677233346 | 2.118651084 |
| ATP6V1D - mRNA | 0.67578652 | 2.417188509 |
| CALM1 - mRNA | 0.67231428 | 1.966211372 |
| DIAPH1 - mRNA | 0.671718791 | 2.312973248 |
| CACNA2D1 - mRNA | 0.664952207 | 2.485190098 |
| MAD2L1 - mRNA | 0.651720161 | 2.482135437 |
| NKIRAS1 - mRNA | 0.643702183 | 2.262960325 |
| GNAI1 - mRNA | 0.640217588 | 1.714972328 |
| MAPK8 - mRNA | 0.634886871 | 2.518950744 |
| GRIA2 - mRNA | 0.633101085 | 1.795734936 |
| CLTC - mRNA | 0.631539492 | 2.682689277 |
| PSMA5 - mRNA | 0.627739528 | 2.96244203 |
| TRIM3 - mRNA | 0.625796777 | 2.160900959 |
| SYNGR1 - mRNA | 0.613098286 | 2.033077213 |
| ATP6V1H - mRNA | 0.61280585 | 1.715251035 |
| NCKAP1 - mRNA | 0.606602325 | 1.844293695 |
| PGK1 - mRNA | 0.60119424 | 2.077691906 |
| TXN - mRNA | 0.596388953 | 2.223449833 |
| ATG5 - mRNA | 0.59631649 | 2.087479756 |
| B4GALT5 - mRNA | 0.592375921 | 2.234431387 |
| STAMBPL1 - mRNA | 0.591910365 | 2.562838417 |
| ZPR1 - mRNA | 0.589918468 | 3.434021774 |
| ACLY - mRNA | 0.586144442 | 3.12739573 |
| PSMC6 - mRNA | 0.575497493 | 2.714056811 |
| MAPK1 - mRNA | 0.572836084 | 2.687324183 |
| TNFRSF21 - mRNA | 0.572146782 | 2.144145178 |
| GABARAPL1 - mRNA | 0.564215775 | 1.738782735 |
| APP - mRNA | 0.560003051 | 1.821531602 |
| MEAF6 - mRNA | 0.55572239 | 2.33573698 |
| REEP5 - mRNA | 0.534216313 | 2.051347495 |
| RLIM - mRNA | 0.528364097 | 2.131842654 |
| SHANK2 - mRNA | 0.525302598 | 1.808518577 |
| ACSL3 - mRNA | 0.512476292 | 2.765626134 |
| YWHAE - mRNA | 0.510352923 | 1.997561794 |
| CSNK2A1/3 - mRNA | 0.508070203 | 2.536197367 |
| DYNC1LI1 - mRNA | 0.507608722 | 1.979187294 |
| GSK3B - mRNA | 0.502941772 | 2.4575882 |
| ABI2 - mRNA | 0.502550718 | 2.620434724 |
| AP3M2 - mRNA | 0.498920213 | 1.754309728 |
| ATP2A2 - mRNA | 0.498462148 | 2.294913287 |
| FIG4 - mRNA | 0.496092259 | 2.24362366 |
| BRAF - mRNA | 0.492302539 | 3.045037412 |
| ANAPC1 - mRNA | 0.491267133 | 2.618024011 |
| KRAS - mRNA | 0.48435897 | 1.881810293 |
| DNM3 - mRNA | 0.465614224 | 1.704831045 |
| CUL1 - mRNA | 0.44181277 | 2.400804532 |
| ULK1 - mRNA | 0.433505093 | 1.904689803 |
| SERINC3 - mRNA | 0.431901038 | 2.096997932 |
| GNB1 - mRNA | 0.423548346 | 2.892864251 |
| ATRN - mRNA | 0.412060634 | 1.850877956 |
| PRKCI - mRNA | 0.411938315 | 2.144298639 |
| RAD23B - mRNA | 0.404755516 | 2.092129219 |
| KPNA1 - mRNA | 0.381365508 | 2.241218693 |
| ABCE1 - mRNA | 0.363557028 | 1.878343697 |
| PDHA1 - mRNA | 0.35717273 | 1.931822902 |
| ATP9A - mRNA | 0.345132246 | 1.876206705 |
| PSMD14 - mRNA | 0.329644117 | 1.713425726 |
| CTSD - mRNA | -0.393157053 | 1.920089355 |
| JAK1 - mRNA | -0.416864604 | 1.974333465 |
| RECK - mRNA | -0.45556215 | 2.453338079 |
| TICAM1 - mRNA | -0.496543176 | 2.373288141 |
| HSD17B4 - mRNA | -0.505298988 | 3.206893239 |
| STAT2 - mRNA | -0.546190807 | 2.726190105 |
| GAS6 - mRNA | -0.564993165 | 2.231567017 |
| AKT1 - mRNA | -0.586231835 | 1.770457928 |
| PKD2 - mRNA | -0.587444597 | 2.949793233 |
| DLX2 - mRNA | -0.58971835 | 1.964722442 |
| BHLHE41 - mRNA | -0.594814879 | 1.796635386 |
| SLC46A1 - mRNA | -0.615250765 | 2.307265974 |
| NINJ2 - mRNA | -0.623288297 | 1.79239465 |
| OLIG2 - mRNA | -0.660888561 | 2.258969711 |
| TJP1 - mRNA | -0.670529882 | 2.062996634 |
| SCD5 - mRNA | -0.687825965 | 1.758334233 |
| DLX1 - mRNA | -0.697677515 | 1.820857037 |
| SCP2 - mRNA | -0.702742456 | 3.028781995 |
| ITGAM - mRNA | -0.712150444 | 1.843638005 |
| CNP - mRNA | -0.728876524 | 2.624542907 |
| ADGRA2 - mRNA | -0.732452577 | 2.336367627 |
| PTGIS - mRNA | -0.734615836 | 1.884051201 |
| ENTPD1 - mRNA | -0.746925918 | 2.588440584 |
| ITM2A - mRNA | -0.771108243 | 1.912806701 |
| EGF - mRNA | -0.775219311 | 2.172442703 |
| ERMN - mRNA | -0.784402119 | 1.833821456 |
| ITGAX - mRNA | -0.806770926 | 1.963235045 |
| AHCYL1 - mRNA | -0.814555336 | 1.719177829 |
| CPNE2 - mRNA | -0.816474996 | 2.477271213 |
| CYSLTR1 - mRNA | -0.818440428 | 2.024348128 |
| HSD11B1 - mRNA | -0.829698574 | 2.98963908 |
| SALL1 - mRNA | -0.836885748 | 1.702787451 |
| LAMP2 - mRNA | -0.838638926 | 3.034281228 |
| TIMP2 - mRNA | -0.852727158 | 3.174280616 |
| CSPG4 - mRNA | -0.855282168 | 1.699097591 |
| ITGA7 - mRNA | -0.858253307 | 2.203417138 |
| GRN - mRNA | -0.860959026 | 3.931396962 |
| P2RY11 - mRNA | -0.861122587 | 2.363630703 |
| IL21R - mRNA | -0.863811934 | 1.805678387 |
| SOX2 - mRNA | -0.884088718 | 2.912064408 |
| CCR5 - mRNA | -0.887486059 | 2.303424229 |
| GJB1 - mRNA | -0.89409743 | 3.840177354 |
| CEACAM3 - mRNA | -0.917447635 | 1.718815784 |
| MS4A1 - mRNA | -0.922784681 | 1.894304516 |
| KLRK1 - mRNA | -0.923118215 | 2.03734365 |
| HLA-A - mRNA | -0.924505983 | 1.950258982 |
| MAFB - mRNA | -0.928106095 | 3.596527029 |
| LSR - mRNA | -0.937991062 | 2.099391279 |
| MERTK - mRNA | -0.942230697 | 2.973753083 |
| CNTF - mRNA | -0.945181184 | 3.440543396 |
| PLP1 - mRNA | -0.950394766 | 2.616822875 |
| PTGER4 - mRNA | -0.953627861 | 2.238905125 |
| TMEM119 - mRNA | -0.955240123 | 2.408504381 |
| NOSTRIN - mRNA | -0.95620864 | 1.812194123 |
| CD9 - mRNA | -0.965362371 | 1.928068069 |
| SELENOS - mRNA | -0.966025536 | 2.381926915 |
| TFEC - mRNA | -0.979529846 | 1.783661122 |
| ALDH1L1 - mRNA | -0.988282388 | 2.232382152 |
| OLIG1 - mRNA | -0.988747174 | 2.127124767 |
| IL10RA - mRNA | -0.989385237 | 2.76211199 |
| SOX10 - mRNA | -0.994836926 | 2.677931345 |
| NLRP1 - mRNA | -0.995131928 | 2.01611036 |
| CTSS - mRNA | -0.996525135 | 1.896037781 |
| FA2H - mRNA | -0.999281332 | 2.836512415 |
| KCND1 - mRNA | -1.003038114 | 2.687292711 |
| SLC2A5 - mRNA | -1.004509425 | 1.713068445 |
| SLCO2B1 - mRNA | -1.008026648 | 2.834218529 |
| PMP22 - mRNA | -1.014416151 | 4.048081157 |
| ERBB3 - mRNA | -1.015788801 | 3.895007325 |
| PRF1 - mRNA | -1.025002674 | 1.759210446 |
| CSF1 - mRNA | -1.032192991 | 2.13951733 |
| TLR7 - mRNA | -1.035948571 | 1.770316797 |
| MYRF - mRNA | -1.036655394 | 1.869629617 |
| CD33 - mRNA | -1.0445459 | 2.984907092 |
| C1S - mRNA | -1.047837809 | 2.101137736 |
| PLXDC2 - mRNA | -1.053157797 | 4.198921334 |
| MAG - mRNA | -1.062027221 | 1.908761951 |
| UGT8 - mRNA | -1.065450174 | 3.115791754 |
| ALDH1A1 - mRNA | -1.070393671 | 2.369309764 |
| PTPRC - mRNA | -1.073119834 | 2.329953915 |
| TGM1 - mRNA | -1.075140124 | 2.938760734 |
| KLRB1 - mRNA | -1.077875323 | 1.96157755 |
| SPI1 - mRNA | -1.081145312 | 2.640229366 |
| KIR2DL3 - mRNA | -1.090713511 | 1.774319322 |
| P2RY14 - mRNA | -1.092290684 | 2.475477055 |
| HDC - mRNA | -1.099492654 | 2.216447345 |
| TSPO - mRNA | -1.113641609 | 2.881174716 |
| TIE1 - mRNA | -1.118034156 | 2.535422157 |
| CD3D - mRNA | -1.13214563 | 1.97727806 |
| TGFB1 - mRNA | -1.133335462 | 2.91861679 |
| CLDN5 - mRNA | -1.154996705 | 2.295071942 |
| ADCYAP1R1 -mRNA | -1.166703069 | 4.400938125 |
| CLEC7A - mRNA | -1.178811097 | 2.071823739 |
| TBX21 - mRNA | -1.194747791 | 2.375802367 |
| EGFR - mRNA | -1.195300507 | 3.433184742 |
| FAM30A - mRNA | -1.196299873 | 2.325579871 |
| KCTD12 - mRNA | -1.198689902 | 3.187341701 |
| LILRB4 - mRNA | -1.199190275 | 3.242314051 |
| C3AR1 - mRNA | -1.202783824 | 1.79753248 |
| AQP4 - mRNA | -1.205206913 | 3.344658196 |
| ADORA3 - mRNA | -1.213055577 | 1.883250749 |
| MS4A4A - mRNA | -1.227267878 | 1.888386446 |
| CD109 - mRNA | -1.235071695 | 2.247720553 |
| VIM - mRNA | -1.265467861 | 2.051753652 |
| SELPLG - mRNA | -1.266346765 | 2.496666015 |
| TLR3 - mRNA | -1.274374674 | 2.934684593 |
| P2RY1 - mRNA | -1.277152616 | 3.150082053 |
| LAIR1 - mRNA | -1.281506596 | 2.304075187 |
| CSF1R - mRNA | -1.289868506 | 2.513658092 |
| RHOB - mRNA | -1.294972863 | 3.414023611 |
| SOX9 - mRNA | -1.297539906 | 3.769367195 |
| RFX4 - mRNA | -1.307713927 | 2.858941921 |
| AGMO - mRNA | -1.324806147 | 2.959027559 |
| FCGRT - mRNA | -1.325799855 | 3.695450178 |
| LRRC25 - mRNA | -1.355495124 | 3.355357204 |
| PLEKHB1 - mRNA | -1.356334235 | 3.087056281 |
| TLR4 - mRNA | -1.363957215 | 2.873748979 |
| ABCA1 - mRNA | -1.390588748 | 2.437425864 |
| TLR2 - mRNA | -1.414107956 | 3.034313079 |
| SERPING1 - mRNA | -1.432977066 | 3.05399254 |
| GDPD2 - mRNA | -1.463402045 | 3.608418821 |
| IGFBP5 - mRNA | -1.466368999 | 3.044012993 |
| S100A10 - mRNA | -1.469458217 | 2.343770131 |
| SLC11A1 - mRNA | -1.487931058 | 2.137304111 |
| SIGLEC5 - mRNA | -1.503273686 | 2.193316068 |
| CSF3R - mRNA | -1.505708199 | 3.943722943 |
| CFI - mRNA | -1.509878234 | 2.303204162 |
| GSN - mRNA | -1.595054098 | 3.870541338 |
| NWD1 - mRNA | -1.603964624 | 2.599739074 |
| SPARC - mRNA | -1.605325113 | 3.081767932 |
| IL18 - mRNA | -1.655704436 | 2.78974419 |
| PLXNB3 - mRNA | -1.766036402 | 4.291146844 |
| CD163 - mRNA | -1.949612756 | 2.588219644 |
| ENTPD2 - mRNA | -2.279332349 | 4.101361828 |
| CD44 - mRNA | -2.364184755 | 1.876769291 |
| C4A/B - mRNA | -2.716240375 | 4.539406814 |
| GFAP - mRNA | -3.08847536 | 4.638839401 |

**Supplementary Table 3.** DisGeNET analysis of genes *GFAP* and *RTN4* involved in COVID-19 and FTD

|  |  |  |  |
| --- | --- | --- | --- |
| **Gene** | **DPI** | **DSI** | **pLi** |
| *GFAP* | 0.885 | 0.421 | 1.46E-06 |
| *RTN4* | 0.692 | 0.621 | 0.45318 |

**Supplementary Table 4.** List of approved and immunotherapeutic drugs interactions for the FTD-breast cancer comorbid genes using the drug gene interaction database (DGIdb) <https://www.dgidb.org/search_interactions>

|  |  |  |  |
| --- | --- | --- | --- |
| ***AKT3*** | ***VDAC1*** | ***ADCYAP1R1*** | ***GFAP*** |
| **Drug Name**  **(Interaction Score)** | **Drug Name**  **(Interaction Score)** | **Drug Name**  **(Interaction Score)** | **Drug Name**  **(Interaction Score)** |
| XL-418 (2.25) | OLESOXIME (15.46) | NALOXONE (5.62) | SORBITOL (1.65) |
| IPATASERTIB (1.61) |  | INSULIN (1.21) | PERMETHRIN (1.24) |
| AFURESERTIB (1.41) |  |  | FADROZOLE (0.99) |
| TRICIRIBINE (1.12) |  |  | DEMECOLCINE (0.82) |
| MK-2201 (0.94) |  |  | OPRELVEKIN (0.82) |
| MIRANSERTIB (0.94) |  |  | DRONABINOL (0.62) |
| AZD-5363 (0.94) |  |  | AMPHETAMINE (0.57) |
| SR-13668 (0.94) |  |  | PIOGLITAZONE (0.33) |
| ARCHEXIN (0.94) |  |  | CAPSAICIN (0.33) |
| MSC-2363318A (0.94) |  |  | NIMODIPINE (0.33) |
| TRICIRIBINE PHOSPHATE (0.94) |  |  | PROPRANOLOL (0.31) |
| UPROSERTIB (0.94) |  |  | PRASTERONE (0.27) |
| MK-2206 (0.83) |  |  | METHIMAZOLE (0.27) |
| CAPIVASERTIB (0.62) |  |  | NIFEDIPINE (0.21) |
| LY-2780301 (0.56) |  |  | MELATONIN (0.19) |
| PERIFOSINE (0.56) |  |  | CAFFEINE (0.18) |
| GSK-690693 (0.33) |  |  | STAUROSPORINE (0.18) |
| VEMURAFENIB (0.19) |  |  | ISOPROTERENOL (0.18) |
| OMIPALISIB (0.15) |  |  | COLCHICINE (0.16) |
| FASUDIL (0.09) |  |  | PENTOXIFYLLINE (0.15) |
| EVEROLIMUS (0.07) |  |  | DISULFIRAM (0.13) |
| GSK-269962A (0.06) |  |  | LITHIUM (0.11) |
|  |  |  | GENISTEIN (0.1) |
|  |  |  | PROGESTERONE (0.07) |
|  |  |  | ASPIRIN (0.07) |

**Supplementary Table 5:** List of RNA binding proteins interacting with the FTD-breast cancer comorbid genes *AKT3, VDAC1, ADCYAP1R1, GFAP, C4A*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **RBP** | **geneID** | **Gene**  **Name** | **Tissue** | **Disease**  **Num** | **Diseases** | **cosmicNum** | **SampleNum** | **mutTypeNum** | **clipExpNum** | **ClipNum** |
| EIF4A3 | ENSG00000117020 | *AKT3* | breast | 2 | ductal carcinoma, carcinoma | 3 | 3 | 1 | 1 | 2 |
| FBL | ENSG00000117020 | *AKT3* | breast | 3 | ductal carcinoma,ductolobular carcinoma, carcinoma | 5 | 5 | 1 | 2 | 4 |
| FMR1 | ENSG00000117020 | *AKT3* | breast | 6 | ductal carcinoma,ductolobular carcinoma-PR-positive carcinoma, lobular carcinoma, basal (triple-negative) carcinoma, carcinoma | 12 | 12 | 3 | 4 | 12 |
| IGF2BP1 | ENSG00000117020 | *AKT3* | breast | 5 | duct lobular carcinoma-PR-positive carcinoma, lobular carcinoma, basal (triple-negative) carcinoma, carcinoma | 7 | 7 | 3 | 1 | 6 |
| IGF2BP2 | ENSG00000117020 | *AKT3* | breast | 6 | ductal carcinoma,ductolobular carcinoma, ER-PR-positive carcinoma, lobular carcinoma, basal (triple-negative) carcinoma, carcinoma | 12 | 12 | 3 | 5 | 18 |
| IGF2BP3 | ENSG00000117020 | *AKT3* | breast | 5 | ductal carcinoma,ductolobular carcinoma, ER-PR-positive carcinoma, basal (triple-negative) carcinoma, carcinoma | 7 | 7 | 3 | 1 | 4 |
| MOV10 | ENSG00000117020 | *AKT3* | breast | 5 | ductal carcinoma,ductolobular carcinoma, ER-PR-positive carcinoma, basal (triple-negative) carcinoma, carcinoma | 7 | 7 | 2 | 4 | 10 |
| NOP56 | ENSG00000117020 | *AKT3* | breast | 1 | carcinoma | 1 | 1 | 1 | 1 | 1 |
| NOP58 | ENSG00000117020 | *AKT3* | breast | 3 | ductolobular carcinoma, basal (triple-negative) carcinoma, carcinoma | 4 | 4 | 3 | 2 | 6 |
| RBM47 | ENSG00000117020 | *AKT3* | breast | 5 | ductal carcinoma,ductolobular carcinoma, lobular carcinoma, basal (triple-negative) carcinoma, carcinoma | 6 | 6 | 2 | 1 | 4 |
| SRSF1 | ENSG00000117020 | *AKT3* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 1 | 1 | 1 |
| EIF4A3 | ENSG00000213585 | *VDAC1* | breast | 2 | metaplastic carcinoma, carcinoma | 3 | 3 | 2 | 2 | 4 |
| IGF2BP2 | ENSG00000213585 | *VDAC1* | breast | 2 | metaplastic carcinoma, carcinoma | 2 | 2 | 1 | 2 | 2 |
| DGCR8 | ENSG00000078549 | *ADCYAP1R1* | breast | 1 | carcinoma | 1 | 1 | 1 | 1 | 1 |
| DGCR8 | ENSG00000131095 | *GFAP* | breast | 1 | carcinoma | 1 | 1 | 1 | 1 | 1 |
| FUS | ENSG00000131095 | *GFAP* | breast | 1 | carcinoma | 1 | 1 | 1 | 1 | 1 |
| AUH | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| BCCIP | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| BUD13 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 3 | 3 | 2 | 2 | 3 |
| CSTF2T | ENSG00000244731 | *C4A* | breast | 1 | carcinoma | 1 | 1 | 1 | 1 | 1 |
| EIF4A3 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 1 | 2 | 2 |
| FAM120A | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| GTF2F1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| HNRNPA1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| HNRNPC | ENSG00000244731 | *C4A* | breast | 1 | carcinoma | 1 | 1 | 1 | 1 | 1 |
| HNRNPK | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| HNRNPUL1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| IGF2BP1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| IGF2BP3 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| LARP7 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| LIN28B | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| PRPF8 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| RBFOX2 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| SF3A3 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| SF3B4 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| SLTM | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| SMNDC1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| SND1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| SRSF1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| SRSF7 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| SRSF9 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |
| TRA2A | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 1 | 1 |
| U2AF1 | ENSG00000244731 | *C4A* | breast | 2 | ductal carcinoma, carcinoma | 2 | 2 | 2 | 2 | 2 |

**Supplementary Table 6.** List of RNA binding proteins interacting with the FTD-breast cancer comorbid genes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **GeneID** | **GeneName** | **GeneType** | **RBP** | **ClusterNum** | **ClipSiteNum** |
| ENSG00000117020 | AKT3 | protein\_coding | TARDBP | 84 | 783 |
| ENSG00000213585 | VDAC1 | protein\_coding | TARDBP | 12 | 284 |
| ENSG00000078549 | ADCYAP1R1 | protein\_coding | TARDBP | 9 | 65 |
| ENSG00000131095 | GFAP | protein\_coding | MBNL2 | 6 | 41 |

**Supplementary Table 7.** RBP-mRNA Interaction for FTD-breast cancer comorbid genes

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **GeneID** | **GeneName** | **GeneType** | **PairGeneID** | **PairGeneName** | **PairGeneType** | **Interaction** | **AlignScore** | **MaxConMatch** |
| ENSG00000117020 | AKT3 | protein\_coding | NR\_146151\_blat | RNA45SN3 | rRNA | 25 | 26 | 10 |
| ENSG00000213585 | VDAC1 | protein\_coding | SSU-rRNA | SSU-Rrna | rRNA | 119 | 38 | 12 |
| ENSG00000078549 | ADCYAP1R1 | protein\_coding | NR\_146151\_blat | RNA45SN3 | rRNA | 5 | 17.5 | 9 |
| ENSG00000244731 | C4A | protein\_coding | NR\_146151\_blat | RNA45SN3 | rRNA | 6 | 19 | 7 |
| ENSG00000131095 | GFAP | protein\_coding | NR\_146151\_blat | RNA45SN3 | rRNA | 5 | 17 | 8 |

**Supplementary Table 8:** Pathogenicity Score of for FTD-breast cancer comorbid genes measured with various pathogenicity score tools

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Genes** | **CADD Phred Score** | **CADD Score** | **DANN Phred Score** | **DANN Score** | **regBase PAT Phred Score** | **regBase PAT Score** | **Eigen Phred Score** | **Eigen Score** | **FATHMM-MKL Phred Score** | **FATHMM-MKL Score** | **Eigen**  **\_PC Phred Score** | **Eigen\_PC Score** | **ReMM Phred Score** | **ReMM Score** | **Fit**  **Cons Phred Score** | **Fit**  **Cons Score** | **Geno**  **Canyon Phred Score** | **Geno**  **Canyon Score** | **LINSIGHT Phred Score** | **LINSIGHT Score** | **CDTS Phred Score** | **CDTS Score** |
| AKT3 | 3.356 | 0.0753 | 6.2867 | 0.764 | 1.1319 | 0.0136 | 4.6836 | -0.0339 | 8.4019 | 0.2445 | 5.147 | -0.1476 | 0.7211 | 0.013 | 5.6188 | 0.0744 | 2.8026 | 0.0045 | 2.3568 | 0.0449 | 5.0283 | -1.865 |
| VDAC1 | 27.3171 | 5.8886 | 31.0655 | 0.9984 | 25.8373 | 0.9653 | N/A | 0 | 33.4932 | 0.9954 | 0 | N/A | 0.989 | 22.8892 | 27.3382 | 0.7015 | 99.3328 | 1 | 0 | N/A | 13.5348 | -6.9825 |
| GFAP | 13.6996 | 1.5755 | 7.1954 | 0.7867 | 4.9235 | 0.0658 | 14.7234 | 0.874 | 7.0101 | 0.203 | 15.8363 | 1.2607 | 13.6916 | 0.845 | 13.2325 | 0.1218 | 12.4471 | 1 | 13.7814 | 0.1907 | 6.5415 | -3.0822 |
| C4A | 26.4255 | 5.6079 | 24.7412 | 0.9946 | 22.5452 | 0.9382 | 0 | NA | 21.115 | 0.9794 | 0 | N/A | 18.705 | 0.964 | 20.8745 | 0.5776 | 4.7749 | 0.7376 | 0 | N/A | 0 | N/A |
| ADCYAP1R1 | 11.6226 | 1.1787 | 2.8942 | 0.6248 | 6.245 | 0.0969 | 13.0173 | 0.6259 | 7.8497 | 0.226 | 7.467 | -0.0809 | 11.9722 | 0.795 | 1.8046 | 0.0537 | 5.9097 | 0.9836 | 14.1871 | 0.2167 | 2.2688 | 1.6776 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Key/Legend:** |  |  |  |
| Phred Score = confidence integral of pathogenicity |  |  |  |
| Score = Raw Score |  |  |  |
| Likley Pathogenic |  |  |  |

**Supplementary Table 9.** List of 3’aQTL variants from Brain Frontal Cortex tissue for *AKT3* and *GFAP* genes.

|  |  |  |
| --- | --- | --- |
| *AKT3* | | |
| rs ID | **Variant ID** | **3’aQTL P-value** |
| rs2502342 | chr1\_242907165\_C\_T\_b38 | 0.00003769 |
| rs2998662 | chr1\_242903675\_G\_C\_b38 | 0.00001787 |
| rs2998661 | chr1\_242903316\_G\_A\_b38 | 0.00001246 |
| rs12077950 | chr1\_242902067\_T\_C\_b38 | 0.00003583 |
| rs9725721 | chr1\_242901771\_G\_A\_b38 | 0.00003583 |
| rs6429391 | chr1\_242901126\_T\_G\_b38 | 0.00003583 |
| rs6429389 | chr1\_242900607\_C\_T\_b38 | 0.00003583 |
| rs12075066 | chr1\_242900095\_T\_C\_b38 | 0.00003583 |
| rs12078540 | chr1\_242899843\_G\_A\_b38 | 0.00003583 |
| rs12073551 | chr1\_242898757\_T\_A\_b38 | 0.00003583 |
| rs12087532 | chr1\_242898633\_C\_A\_b38 | 0.00003583 |
| *GFAP* | | |
| rs12941832 | chr17\_44910114\_G\_T\_b38 | 0.00007407 |
| rs34902223 | chr17\_44870901\_C\_T\_b38 | 0.00007407 |
| rs9895349 | chr17\_44866621\_C\_T\_b38 | 0.00007407 |
| rs4793148 | chr17\_44762183\_C\_A\_b38 | 0.0000448 |
| rs3764840 | chr17\_44760112\_C\_T\_b38 | 0.0000448 |
| rs3760382 | chr17\_44758548\_T\_C\_b38 | 0.0000448 |
| rs4426386 | chr17\_44758127\_A\_G\_b38 | 0.0000448 |
| rs2337848 | chr17\_44754386\_G\_A\_b38 | 0.0000448 |
| rs9893320 | chr17\_44747280\_T\_C\_b38 | 0.0000448 |
| rs9911454 | chr17\_44743640\_C\_T\_b38 | 0.0000448 |