|  |  |  |
| --- | --- | --- |
| Node1 | Node2 | Node3 |
| AGAP11 | hsa-miR-135a-5p | RASAL2，FCHO2 |
| AGAP11 | hsa-miR-139-5p | MBNL3 |
| AGAP11 | hsa-miR-17-5p | FCHO2，RORA，YOD1，LPIN1，TMOD3，KAT2B |
| AGAP11 | hsa-miR-20b-5p | FCHO2，KAT2B，YOD1，RORA |
| AGAP11 | hsa-miR-206 | MXD1，CITED2 |
| AGAP11 | hsa-miR-613 | MXD1，CITED2 |
| AGAP11 | hsa-miR-590-5p | MBNL3，RASAL2，YOD1 |
| AGAP11 | hsa-miR-3619-5p | EPS8L2 |
| AGAP11 | hsa-miR-216b-5p | TAB3，ETFDH，RORA，SORT1 |
| AGAP11 | hsa-miR-217 | YOD1，MXD1 |
| AGAP11 | hsa-miR-22-3p | MYO6 |
| AGAP11 | hsa-miR-23b-3p | TAB3，TJP1，RORA，YOD1 |
| AGAP11 | hsa-miR-24-3p | YOD1，USP54 |
| AGAP11 | hsa-miR-1297 | TAB3，RIOK3，MLANA |
| AGAP11 | hsa-miR-27a-3p | LPIN1，TAB3 |
| AGAP11 | hsa-miR-107 | TJP1，RORA |
| AGAP11 | hsa-miR-449c-5p | MLANA |
| AGAP11 | hsa-miR-455-5p | WDR26，TJP1 |
| AGAP11 | hsa-miR-129-5p | MBNL3，RORA，RASAL2，NEBL |
| HCP5 | hsa-miR-507 | MYO10，ETS1，LUM |
| HCP5 | hsa-miR-137 | GBP1，LURAP1L |
| HCP5 | hsa-miR-139-5p | ETS1，CYP24A1 |
| HCP5 | hsa-miR-140-5p | MYO10 |
| HCP5 | hsa-miR-1244 | NUP155，LBH |
| HCP5 | hsa-miR-17-5p | ENTPD7，PGM2L1，IFNAR2，MICB，CEP72，F2R，PLEKHO2，SH2B3，FMNL3，TLR7，STK17B，MMP3，LASP1，MFHAS1，PTPDC1，BTN3A2，CD274 |
| HCP5 | hsa-miR-20b-5p | PTPDC1，PGM2L1，PLEKHO2，CD274，STK17B，LASP1，FMNL3 |
| HCP5 | hsa-miR-761 | F2R，NEK6，PLEKHO2，RCSD1，QSOX2，LPCAT1 |
| HCP5 | hsa-miR-3619-5p | F2R，QSOX2，RCSD1，LPCAT1，NEK6，PLEKHO2 |
| HCP5 | hsa-miR-216b-5p | PSTPIP2，BTN3A2，CCL8，NLRC5 |
| HCP5 | hsa-miR-508-3p | MINPP1，UBASH3B |
| HCP5 | hsa-miR-22-3p | INHBB，SLC7A7 |
| HCP5 | hsa-miR-23b-3p | NEK6，TNFAIP3，LASP1，HOXD10，MFHAS1 |
| HCP5 | hsa-miR-24-3p | TNFAIP3，SLC2A3，DSN1，POLR3D，SH2B3，PIM2，IL7R，NFE2L1，DENND5A，PSTPIP2，BTN3A2，NEK6 |
| HCP5 | hsa-miR-363-3p | LURAP1L，SH2B3，UBASH3B，MFHAS1 |
| HCP5 | hsa-miR-1297 | XDH，SLC2A3，SMG8，PARP14，TAP1，NEK6，MFHAS1，GBP1，INHBB，MINPP1 |
| HCP5 | hsa-miR-27a-3p | PGM2L1，LPCAT1，NEK6，LBH，NRP2 |
| HCP5 | hsa-miR-107 | TGIF2，ENTPD7，SLC2A3，GANAB |
| HCP5 | hsa-miR-375 | LPCAT1 |
| HCP5 | hsa-miR-425-5p | SHCBP1 |
| HCP5 | hsa-miR-125a-5p | TNFAIP3，CYP24A1，MFHAS1，LBH，ETS1 |
| HCP5 | hsa-miR-125b-5p | CYP24A1，LBH，ETS1，TNFAIP3，FMNL3，MFHAS1，QSOX2 |
| HCP5 | hsa-miR-490-3p | RCSD1，MYO10 |
| UCA1 | hsa-miR-135a-5p | ABAT |
| EPB41L4A-AS1 | hsa-miR-17-5p | FIBIN |
| EPB41L4A-AS1 | hsa-miR-20b-5p | FIBIN |
| EPB41L4A-AS1 | hsa-miR-217 | EFNA5 |
| EPB41L4A-AS1 | hsa-miR-425-5p | ACACB |
| AC073321 | hsa-miR-27a-3p | TGFBR3，ASAH1 |
| AC073321 | hsa-miR-107 | TGFBR3，PCSK5 |
| AC073321 | hsa-miR-507 | MRPS10，RAET1E，ZDHHC11 |
| AC073321 | hsa-miR-129-5p | RAET1E，GALNT12，ITPR2 |
| SOX21-AS1 | hsa-miR-301b-3p | ARHGEF26 |
| SOX21-AS1 | hsa-miR-4295 | ARHGEF26 |
| SOX21-AS1 | hsa-miR-3666 | ARHGEF26 |
| HCG22 | hsa-miR-507 | MRPS10，WDR26，ZDHHC11，SECISBP2L，C1orf21 |
| HCG22 | hsa-miR-139-5p | MOSPD1 |
| HCG22 | hsa-miR-140-5p | PHACTR2，MRPS10，KAT2B，FAM214A，MYO6，MPC1，FCHO2，NDUFA2，YOD1 |
| HCG22 | hsa-miR-876-3p | WDR26，CUL4B |
| HCG22 | hsa-miR-1244 | PHACTR2，PIK3C2G，PTN |
| HCG22 | hsa-miR-216b-5p | ETFDH |
| HCG22 | hsa-miR-508-3p | ABLIM3 |
| HCG22 | hsa-miR-22-3p | SLC48A1，RAB5B，MYO6，PHACTR4，LRRC20，PHACTR2 |
| HCG22 | hsa-miR-23b-3p | UBL3，YOD1 |
| HCG22 | hsa-miR-27a-3p | EPB41L4A，LPIN1，ITSN2 |
| HCG22 | hsa-miR-425-5p | HSPB8 |
| HCG22 | hsa-miR-455-5p | CAST，WDR26 |
| HCG22 | hsa-miR-129-5p | GALNT12，RASAL2，PHACTR4，MGLL，ITPR2 |
| HCG22 | hsa-miR-490-3p | PHACTR2，VAT1，FAM214A，RASAL2 |
| CRNDE | hsa-miR-146b-5p | ZNF117 |
| CRNDE | hsa-miR-217 | TRIM13 |
| CRNDE | hsa-miR-22-3p | TRIM13 |
| CRNDE | hsa-miR-23b-3p | ZNF117 |
| CRNDE | hsa-miR-363-3p | CHCHD10 |
| LINC00491 | hsa-miR-429 | CCNE2 |
| LINC00491 | hsa-miR-27a-3p | HOXA10 |
| LINC00515 | hsa-miR-140-5p | PRDM1，ERC2 |
| LINC00515 | hsa-miR-876-3p | DLG2 |
| LINC00515 | hsa-miR-24-3p | POU4F2，DLG2 |
| LINC00515 | hsa-miR-33a-3p | RALGPS2，SLC4A4，IKZF2，DENND4C，DLG2 |

**Additional file 1.** Potential co-expression competing triples (lncRNA-miRNA-mRNA triples)