**Supplementary Materials for**

# Epigenetic Activation of AP-1 Promotes Squamous Cell Carcinoma Metastasis

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This file includes:

**Fig. S1.** KDM4A is required for the abundance of JUN an FOSL1 induced by HGF.

**Fig. S2.** KDM4A, but not KDM4C, is required for the abundance of JUN and FOSL1 induced by HGF.

**Fig. S3.** KDM4A knockdown does not cause global changes of H3K9me3 and H3K36me36

**Fig. S4.** JUN and KDM4A co-occupy on the promoters of *FOSL1* and *JUN* in SCC23/MET cells.

**Fig. S5.** Over-expression of JUN cannot restore the abundance of FOSL1 in KDM4A-depleted cells.

**Fig. S6.** Inefficient KDM4A knockdown might be responsible for lymph node metastasis from KDM4A-depleted SCC23/MET cells.

**Table S1.** A list of genes that were repressed by KDM4A knockdown

**Table S2**. A list of genes that were more abundantly expressed by KDM4A knockdown

**Table S3.** Real-time RT-PCR primers for human histone demethylases

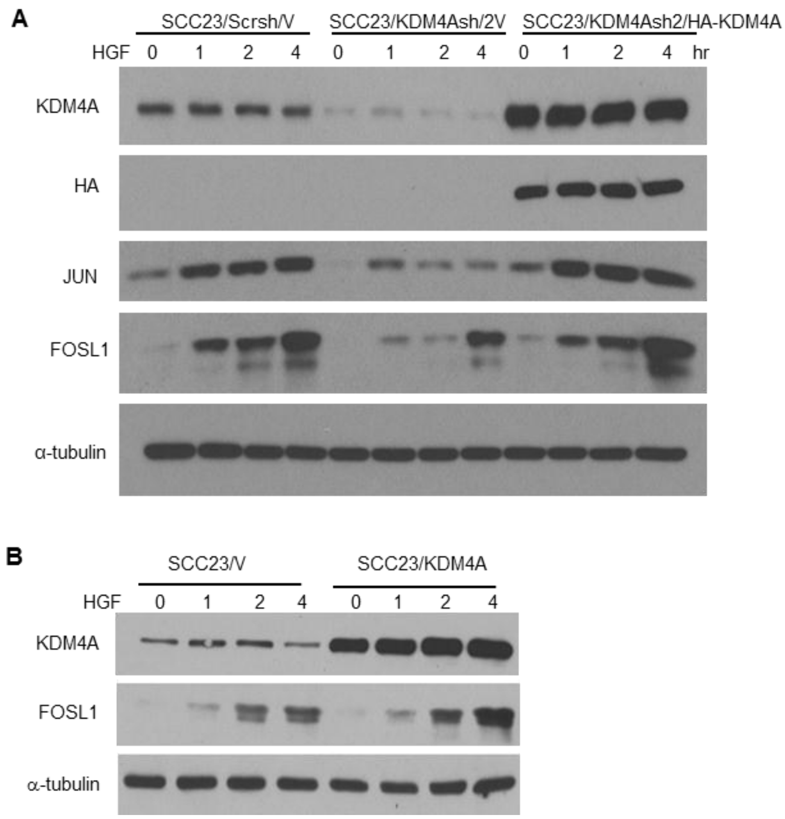


**Fig. S1. KDM4A is required for the abundance of JUN an FOSL1 induced by HGF.** (**A**) Western blot analysis of the abundance of JUN an FOSL1 induced by HGF in SCC23 control (SCC23/Scrsh/V), KDM4A-depleted (SCC23/KDM4Ash/V) and KDM4A-restored (SCC23/KDM4Ash/HA-KDM4A) cells. (**B**) Western blot analysis of the abundance of FOSL1 in cells overexpressing KDM4A (SCC23/KDM4A) compared with control cells (SCC23/V). Data are representative of 2 experiments.

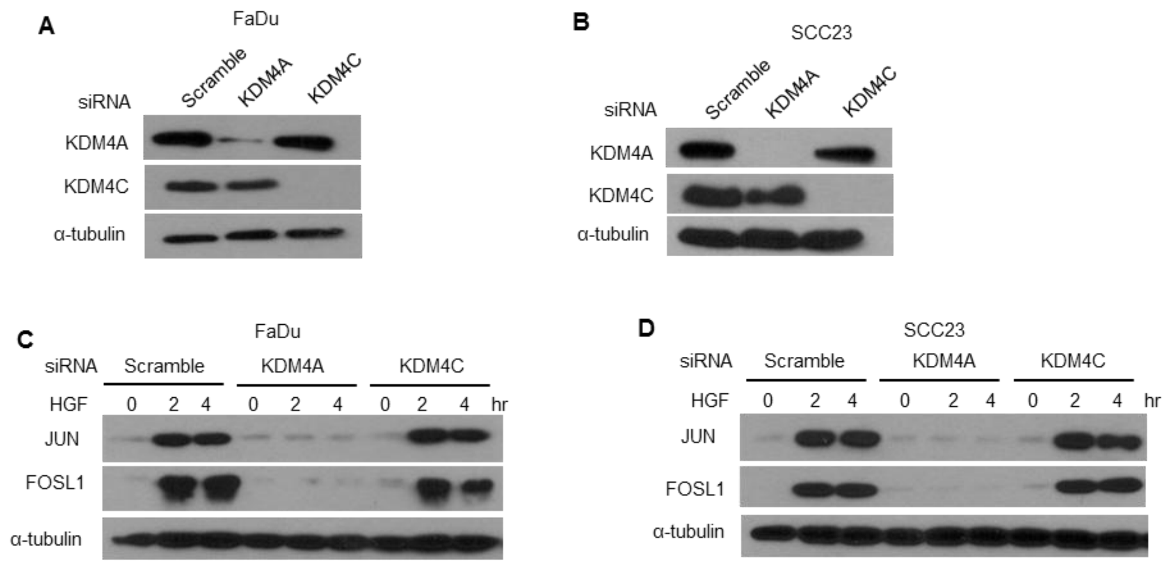


**Fig. S2. KDM4A, but not KDM4C, is required for the abundance of JUN and FOSL1 induced by HGF.** (**A** and **B**) Western blot analysis showing KDM4A and KDM4C knockdown by siRNA in (**A**) FaDu cells or (**B**) SCC23 cells. (**C** and **D**) Western blot analysis of the abundance of JUN and FOSL1 induced by 20 ng/ml of HGF in KDM4A- or KDM4C-depleted FaDu (**C**) or SCC23 cells (**D**). Data are representative of 2 experiments.

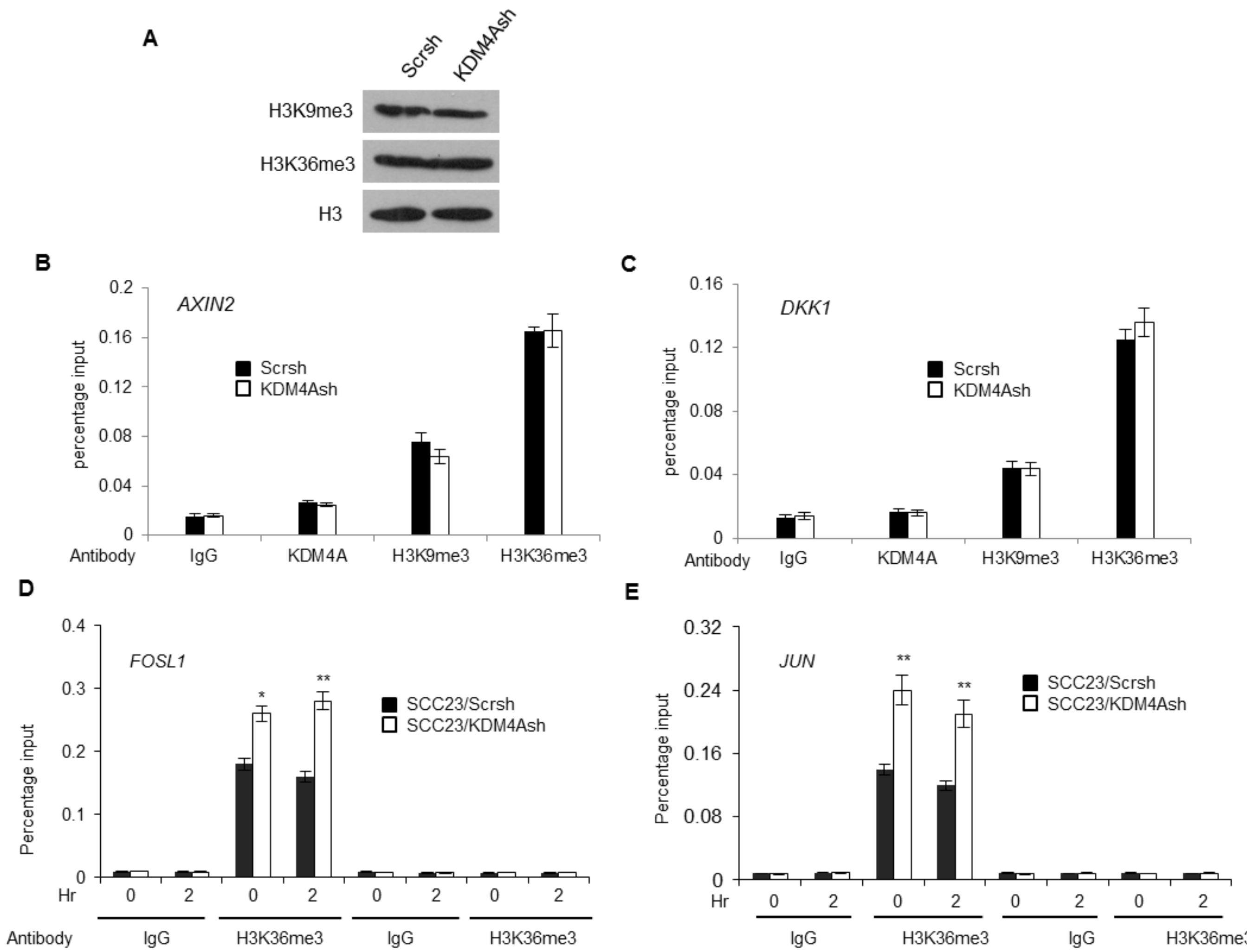


**Fig. S3. KDM4A knockdown does not cause global changes of H3K9me3 and H3K36me36.**

(**A**) Western blot analysis of H3M9me3 and H3K36me3 marks in KDM4A-depleted cells. Scrsh, SCC23/MET/Scrsh cells; KDM4Ash2, SCC23/MET/KDM4Ash2 cells. Blot is representative of 2 experiments. (**B** and **C**) ChIP assays of KDM4A, H3K9me3 and H3K36me3 on the (**B**) *AXIN2* or (**C**) *DKK1* promoter in KDM4A-depleted SCC23/MET cells. (**D** and **E**) ChIP assays of H3K36me3 changes on the (**D**) *FOSL1* or (**E**) *JUN* promoter in KDM4A-depleted cells, either at the AP-1 site or 8kb upstream. Data in (B to E) are means ± s.d. of 3 experiments.*$P < 0.05$; **$P < 0.01$, unpaired two-tailed Student's *t*-test.

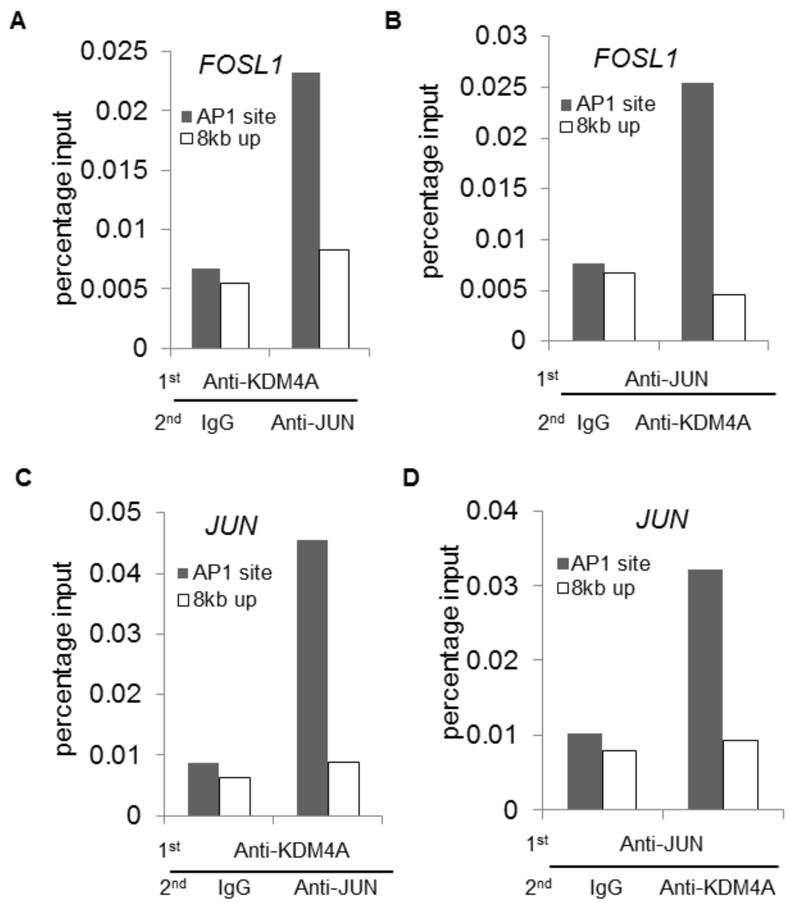


**Fig. S4. JUN and KDM4A co-occupy on the promoters of *FOSL1* and *JUN* in SCC23/MET cells.**(**A** and **B**) Reciprocal re-ChIP assays of the co-occupancy of JUN and KDM4A on the *FOSL1* promoter in SCC23/MET cells. The result represents one of three independent experiments. (**C** and **D**) The reciprocal re-ChIP assays of the co-occupancy of JUN and KDM4A on the *JUN* promoter in SCC23/MET cells. The data represents one of three independent experiments.

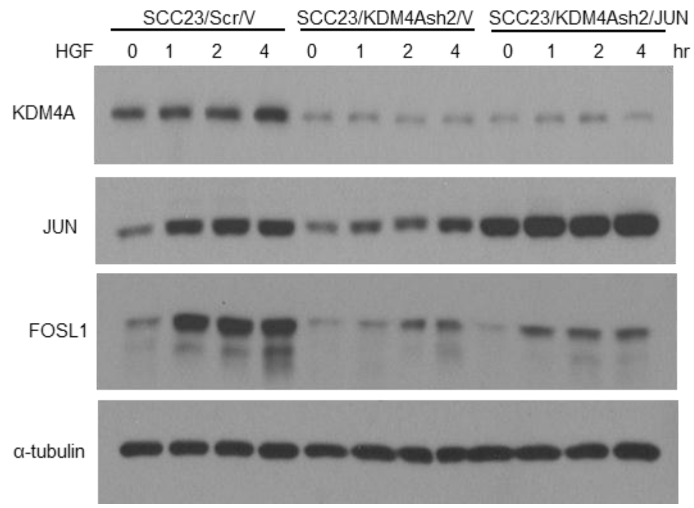


**Fig. S5. Over-expression of JUN cannot restore the abundance of FOSL1 in KDM4A-depleted cells**. Western blot analysis of the abundance of JUN and FOSL1 in SCC23 cells transduced with control shRNA and vector (SCC23/Scr/V), KDM4A-depleted SCC23 cells (SCC23/KDM4Ash2/V), and KDM4A-depleted SCC23 cells overexpressing JUN (SCC23/KDM4Ash2/JUN) treated with 20 ng of HGF per ml for up to 4 hours.

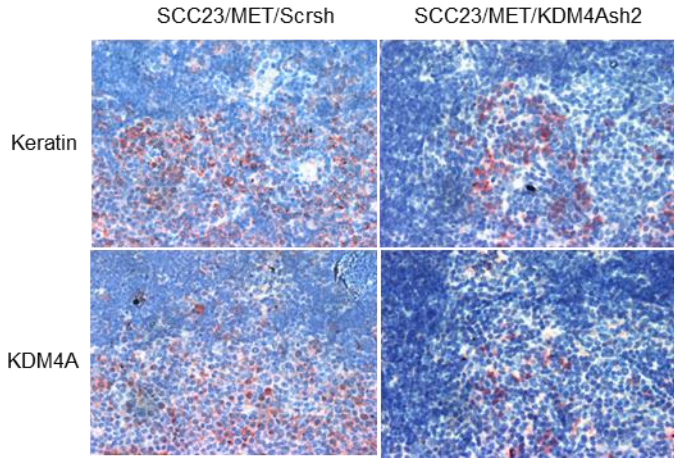


**Fig. S6. Inefficient KDM4A knockdown might be responsible for lymph node metastasis from KDM4A-depleted SCC23/MET cells.** Histological analysis of the abundance of KDM4A in lymph node metastasis from mice with tumor xenografts of either SCC23/MET/Scrsh or SCC23/MET/KDM4Ash2 cells. Cells were stained with antibodies against KDM4A and keratin (red) and counterstained with DAPI (blue).

## Table S1. A list of genes that were repressed by KDM4A knockdown

Gene expression profiling of SCC23/MET/Scrsh and SCC23/MET/KDM4Ash2 cells was compared. Genes which had decreased expression by at least two-fold after KDM4A knockdown were listed.

| Probe id | Gene Symbol | Fold Change |
|---|---|---|
| 201041_s_at | DUSP1 | 0.09732242 |
| 226682_at | RORA | 0.1078467 |
| 242517_at | KISS1R | 0.11411252 |
| 209183_s_at | C10orf10 | 0.11673515 |
| 222847_s_at | EGLN3 | 0.12201877 |
| 223333_s_at | ANGPTL4 | 0.12437738 |
| 219232_s_at | EGLN3 | 0.13060744 |
| 210479_s_at | RORA | 0.132921 |
| 221009_s_at | ANGPTL4 | 0.13939667 |
| 212143_s_at | IGFBP3 | 0.14458242 |
| 210095_s_at | IGFBP3 | 0.14884875 |
| 235857_at | KCTD11 | 0.1560953 |
| 210426_x_at | RORA | 0.16137589 |
| 227868_at | LOC154761 | 0.16940014 |
| 219410_at | TMEM45A | 0.18543005 |
| 227337_at | ANKRD37 | 0.1893493 |
| 202672_s_at | ATF3 | 0.19179207 |
| 201170_s_at | BHLHE40 | 0.21027482 |
| 236266_at | RORA | 0.21060667 |
| 201044_x_at | DUSP1 | 0.2147104 |
| 225557_at | CSRNP1 | 0.22307891 |
| 224797_at | ARRDC3 | 0.22714761 |
| 202887_s_at | PPP2R1B | 0.22764963 |
| 202219_at | SLC6A8 | 0.23013575 |
| 212099_at | RHOB | 0.23181904 |
| 209034_at | PNRC1 | 0.23414482 |
| 203438_at | STC2 | 0.23857768 |
| 224657_at | ERRFI1 | 0.24359527 |
| 215813_s_at | PTGS1 | 0.24913817 |
| 205969_at | AADAC | 0.25156079 |
| 201694_s_at | EGR1 | 0.25280204 |
| 212188_at | KCTD12 | 0.25419702 |
| 207574_s_at | GADD45B | 0.25696397 |
| 211559_s_at | CCNG2 | 0.26673629 |
| 203439_s_at | STC2 | 0.2707417 |
| 221479_s_at | BNIP3L | 0.27305434 |
| 227404_s_at | EGR1 | 0.27428849 |
| 226452_at | PDK1 | 0.27762666 |
| 210854_x_at | SLC6A8 | 0.27807308 |
| 204614_at | SERPINB2 | 0.28218046 |
| 1564027_a_at | FAM115C | 0.28636737 |
| 202770_s_at | CCNG2 | 0.29501455 |
| 213843_x_at | SLC6A8 | 0.29682675 |
| 227697_at | SOCS3 | 0.29714273 |
| 209305_s_at | GADD45B | 0.30295323 |
| 207517_at | LAMC2 | 0.30511986 |
| 201465_s_at | JUN | 0.30732861 |

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|---|---|---|
| 203504_s_at | ABCA1 | 0.30854119 |
| 203505_at | ABCA1 | 0.31018353 |
| 209822_s_at | VLDLR | 0.31421697 |
| 212110_at | SLC39A14 | 0.3164953 |
| 230630_at | AK3L1 | 0.31721436 |
| 225342_at | AK3L1 | 0.31779889 |
| 211708_s_at | SCD | 0.31784405 |
| 205476_at | CCL20 | 0.31880651 |
| 227038_at | SGMS2 | 0.31958088 |
| 200831_s_at | SCD | 0.32225821 |
| 1554008_at | OSMR | 0.32327369 |
| 202769_at | CCNG2 | 0.32433531 |
| 208893_s_at | DUSP6 | 0.3253729 |
| 202364_at | MXI1 | 0.32719033 |
| 205199_at | CA9 | 0.3276951 |
| 223394_at | SERTAD1 | 0.32926544 |
| 221478_at | BNIP3L | 0.33253106 |
| 216867_s_at | PDGFA | 0.3339037 |
| 215177_s_at | ITGA6 | 0.3347514 |
| 202619_s_at | PLOD2 | 0.33617492 |
| 202628_s_at | SERPINE1 | 0.33697349 |
| 228846_at | MXD1 | 0.33880146 |
| 205128_x_at | PTGS1 | 0.33962063 |
| 201169_s_at | BHLHE40 | 0.34033395 |
| 211162_x_at | SCD | 0.34049441 |
| 204194_at | BACH1 | 0.34156499 |
| 201531_at | ZFP36 | 0.34171228 |
| 226436_at | RASSF4 | 0.3449942 |
| 214446_at | ELL2 | 0.34862671 |
| 219181_at | LIPG | 0.34906679 |
| 212192_at | KCTD12 | 0.35279451 |
| 209457_at | DUSP5 | 0.35603624 |
| 201466_s_at | JUN | 0.3584662 |
| 1554980_a_at | ATF3 | 0.3599494 |
| 202627_s_at | SERPINE1 | 0.36237366 |
| 238063_at | TMEM154 | 0.3624852 |
| 221011_s_at | LBH | 0.36540544 |
| 227180_at | ELOVL7 | 0.36612241 |
| 1569582_at | LOC201651 | 0.37136429 |
| 209304_x_at | GADD45B | 0.37280575 |
| 229396_at | OVOL1 | 0.37374055 |
| 201294_s_at | WSB1 | 0.3748889 |
| 205281_s_at | PIGA | 0.37516314 |
| 208892_s_at | DUSP6 | 0.3752201 |
| 215812_s_at | LOC653562 /// SLC6A10P /// SLC6A8 | 0.37583231 |
| 202081_at | IER2 | 0.37605276 |
| 219888_at | SPAG4 | 0.37660133 |
| 203108_at | GPRC5A | 0.37750954 |
| 226021_at | RDH10 | 0.37941431 |
| 234932_s_at | CDCP1 | 0.38056295 |
| 211527_x_at | VEGFA | 0.38416953 |
| 208891_at | DUSP6 | 0.38467127 |
| 204036_at | LPAR1 | 0.38523054 |
| 222108_at | AMIGO2 | 0.38546907 |
| 228149_at | C7orf60 | 0.38776755 |
| 212368_at | ZNF292 | 0.38781137 |

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|---|---|---|
| 201848_s_at | BNIP3 | 0.38784524 |
| 209566_at | INSIG2 | 0.38805606 |
| 201849_at | BNIP3 | 0.3905754 |
| 210512_s_at | VEGFA | 0.39145164 |
| 202441_at | ERLIN1 | 0.39196697 |
| 203574_at | NFIL3 | 0.39218058 |
| 227719_at | SMAD9 | 0.39232631 |
| 202768_at | FOSB | 0.39613663 |
| 203705_s_at | FZD7 | 0.39740943 |
| 202241_at | TRIB1 | 0.39756151 |
| 220239_at | KLHL7 | 0.40022911 |
| 219239_s_at | ZNF654 | 0.40213477 |
| 201626_at | INSIG1 | 0.40302242 |
| 200920_s_at | BTG1 | 0.40307522 |
| 226431_at | FAM117B | 0.40527947 |
| 225366_at | PGM2 | 0.4062757 |
| 201464_x_at | JUN | 0.40944739 |
| 205227_at | IL1RAP | 0.40978185 |
| 204420_at | FOSL1 | 0.40994919 |
| 204668_at | RNF24 | 0.41027752 |
| 206686_at | PDK1 | 0.41044591 |
| 213281_at | LOC100288387 | 0.41206276 |
| 204669_s_at | RNF24 | 0.41573468 |
| 227458_at | CD274 | 0.41801337 |
| 200921_s_at | BTG1 | 0.41894594 |
| 205266_at | LIF | 0.42233538 |
| 211719_x_at | FN1 | 0.42253478 |
| 224580_at | SLC38A1 | 0.42574781 |
| 239572_at | GJA3 | 0.42576964 |
| 213865_at | DCBLD2 | 0.42577289 |
| 216442_x_at | FN1 | 0.426884 |
| 225144_at | BMPR2 | 0.42740598 |
| 209596_at | MXRA5 | 0.42762942 |
| 215446_s_at | LOX | 0.42824936 |
| 201631_s_at | IER3 | 0.43071247 |
| 203987_at | FZD6 | 0.4322821 |
| 224606_at | KLF6 | 0.43286078 |
| 212464_s_at | FN1 | 0.43316242 |
| 224973_at | FAM46A | 0.43390376 |
| 201325_s_at | EMP1 | 0.43499418 |
| 223423_at | GPR160 | 0.4352783 |
| 202620_s_at | PLOD2 | 0.43920306 |
| 202444_s_at | ERLIN1 | 0.43959504 |
| 209185_s_at | IRS2 | 0.44004989 |
| 229010_at | CBL | 0.44019419 |
| 225524_at | ANTXR2 | 0.44220983 |
| 219496_at | ANKRD57 | 0.44223221 |
| 202696_at | OXSR1 | 0.44374722 |
| 203499_at | EPHA2 | 0.44420052 |
| 212079_s_at | MLL | 0.44430892 |
| 202014_at | PPP1R15A | 0.44623296 |
| 210495_x_at | FN1 | 0.44811161 |
| 235216_at | ESCO1 | 0.44843848 |
| 210139_s_at | PMP22 | 0.44856066 |
| 207528_s_at | SLC7A11 | 0.44885084 |
| 1555832_s_at | KLF6 | 0.44956543 |
| 201565_s_at | ID2 | 0.45040258 |

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|---|---|---|
| 201983_s_at | EGFR | 0.4504847 |
| 225946_at | RASSF8 | 0.45126538 |
| 209212_s_at | KLF5 | 0.45147844 |
| 212113_at | ATXN7L3B | 0.45292152 |
| 203706_s_at | FZD7 | 0.45293722 |
| 227345_at | TNFRSF10D | 0.45327453 |
| 208936_x_at | LGALS8 | 0.45402952 |
| 228328_at | KLHL28 | 0.45409152 |
| 201627_s_at | INSIG1 | 0.45581522 |
| 205910_s_at | CEL | 0.45656716 |
| 228188_at | FOSL2 | 0.45712639 |
| 211506_s_at | IL8 | 0.45734222 |
| 203476_at | TPBG | 0.45762888 |
| 203083_at | THBS2 | 0.457725 |
| 221753_at | SSH1 | 0.45848708 |
| 202843_at | NDUFB7 | 0.45861581 |
| 225492_at | TMEM33 | 0.45915049 |
| 203204_s_at | KDM4A | 0.45942046 |
| 223839_s_at | SCD | 0.4601726 |
| 226464_at | C3orf58 | 0.46022556 |
| 200832_s_at | SCD | 0.46024597 |
| 219911_s_at | SLCO4A1 | 0.4628652 |
| 221766_s_at | FAM46A | 0.46318903 |
| 201473_at | JUNB | 0.46337207 |
| 226863_at | FAM110C | 0.46431314 |
| 228498_at | B4GALT1 | 0.46491665 |
| 226275_at | MXD1 | 0.46493019 |
| 202131_s_at | RIOK3 | 0.4650604 |
| 202284_s_at | CDKN1A | 0.4651368 |
| 224314_s_at | EGLN1 | 0.46518484 |
| 232291_at | MIR17HG | 0.46529158 |
| 235907_at | TMEM33 | 0.46635969 |
| 212902_at | SEC24A | 0.46674355 |
| 207543_s_at | P4HA1 | 0.4672333 |
| 201324_at | EMP1 | 0.4686413 |
| 208961_s_at | KLF6 | 0.46866469 |
| 205729_at | OSMR | 0.46881187 |
| 208078_s_at | SIK1 | 0.46907971 |
| 1563900_at | FAM83B | 0.46917173 |
| 226199_at | UPRT | 0.46925662 |
| 228051_at | KIAA1244 | 0.46954033 |
| 218451_at | CDCP1 | 0.47012327 |
| 1554462_a_at | DNAJB9 | 0.47153704 |
| 209946_at | VEGFC | 0.47164131 |
| 209373_at | MALL | 0.47214798 |
| 219326_s_at | B3GNT2 | 0.47264274 |
| 223092_at | ANKH | 0.472998 |
| 219549_s_at | RTN3 | 0.47373626 |
| 202912_at | ADM | 0.47373954 |
| 1555950_a_at | CD55 | 0.47376253 |
| 224888_at | EPT1 | 0.47402038 |
| 233819_s_at | RNF160 | 0.47420211 |
| 1557257_at | BCL10 | 0.47480005 |
| 226982_at | ELL2 | 0.47535031 |
| 218880_at | FOSL2 | 0.4767104 |
| 205463_s_at | PDGFA | 0.47766133 |
| 201299_s_at | MOBKL1B | 0.47798889 |

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|---|---|---|
| 205220_at | GPR109B | 0.47844633 |
| 219747_at | C4orf31 | 0.48005347 |
| 226621_at | OSMR | 0.4800904 |
| 223059_s_at | FAM107B | 0.48050722 |
| 231873_at | BMPR2 | 0.48084873 |
| 227810_at | ZNF558 | 0.48175181 |
| 222662_at | PPP1R3B | 0.48188473 |
| 227268_at | RNFT1 | 0.48226834 |
| 201926_s_at | CD55 | 0.48246661 |
| 213446_s_at | IQGAP1 | 0.48257531 |
| 201996_s_at | SPEN | 0.48282758 |
| 209920_at | BMPR2 | 0.48291829 |
| 225262_at | FOSL2 | 0.4845784 |
| 209101_at | CTGF | 0.48473629 |
| 205198_s_at | ATP7A | 0.48499541 |
| 227467_at | RDH10 | 0.48597028 |
| 221752_at | SSH1 | 0.48601037 |
| 217678_at | SLC7A11 | 0.48705851 |
| 222664_at | KCTD15 | 0.4879134 |
| 212665_at | TIPARP | 0.48809741 |
| 210845_s_at | PLAUR | 0.48834106 |
| 224675_at | MESDC2 | 0.48928467 |
| 202067_s_at | LDLR | 0.49002559 |
| 36711_at | MAFF | 0.4903324 |
| 202668_at | EFNB2 | 0.49216228 |
| 227101_at | ZNF800 | 0.49275144 |
| 242918_at | NASP | 0.49279824 |
| 226899_at | UNC5B | 0.49329241 |
| 201883_s_at | B4GALT1 | 0.4943381 |
| 223028_s_at | SNX9 | 0.49464418 |
| 230440_at | ZNF469 | 0.49514295 |
| 208960_s_at | KLF6 | 0.49529227 |
| 209921_at | SLC7A11 | 0.49539527 |
| 205865_at | ARID3A | 0.49544403 |
| 211165_x_at | EPHB2 | 0.49678276 |
| 206662_at | GLRX | 0.49710689 |
| 204029_at | CELSR2 | 0.49779581 |
| 202842_s_at | FUCA1 | 0.49847394 |
| 201925_s_at | CD55 | 0.49922947 |
| 229115_at | DYNC1H1 | 0.49956178 |

**Table S2. A list of genes that were more abundantly expressed by KDM4A knockdown**

Gene expression profiling of SCC23/MET/Scrsh and SCC23/MET/KDM4Ash2 cells was compared.

Genes which had increased expression by at least two-fold after KDM4A knockdown were listed.

| Probe id | Gene Symbol | Fold Change |
|---|---|---|
| 207339_s_at | LTB | 3.830801 |
| 222717_at | SDPR | 3.800539 |
| 218330_s_at | NAV2 | 3.581865 |
| 221232_s_at | ANKRD2 | 3.291787 |
| 204279_at | PSMB9 | 2.987768 |
| 225355_at | NEURL1B | 2.949297 |
| 203153_at | IFIT1 | 2.84178 |
| 218032_at | SNN | 2.750336 |
| 204159_at | CDKN2C | 2.75005 |
| 239710_at | FIGN | 2.653337 |
| 241994_at | XDH | 2.611372 |
| 1555812_a_at | ARHGDIB | 2.589005 |
| 1555310_a_at | PAK6 | 2.579088 |
| 227420_at | TNFAIP8L1 | 2.555685 |
| 205083_at | AOX1 | 2.514485 |
| 206504_at | CYP24A1 | 2.499747 |
| 225817_at | CGNL1 | 2.431342 |
| 1555758_a_at | CDKN3 | 2.411858 |
| 229579_s_at | DISP2 | 2.40829 |
| 230720_at | RNF182 | 2.407355 |
| 206632_s_at | APOBEC3B | 2.398149 |
| 238964_at | FIGN | 2.388475 |
| 224480_s_at | AGPAT9 | 2.381937 |
| 229450_at | IFIT3 | 2.367701 |
| 205547_s_at | TAGLN | 2.356659 |
| 218755_at | KIF20A | 2.354288 |
| 242828_at | FIGN | 2.352474 |
| 201288_at | ARHGDIB | 2.348331 |
| 202270_at | GBP1 | 2.343887 |
| 213201_s_at | TNNT1 | 2.328715 |
| 219461_at | PAK6 | 2.324283 |
| 238989_at | C1GALT1C1 | 2.307249 |
| 1555724_s_at | TAGLN | 2.289264 |
| 238756_at | GAS2L3 | 2.279381 |
| 219493_at | SHCBP1 | 2.257145 |
| 209714_s_at | CDKN3 | 2.246927 |
| 221436_s_at | CDCA3 | 2.223754 |
| 227609_at | EPSTI1 | 2.223709 |
| 202954_at | UBE2C | 2.218814 |
| 214858_at | PP14571 | 2.217766 |
| 202609_at | EPS8 | 2.2041 |
| 223707_at | RPL27A | 2.200567 |
| 242470_at | EID2B | 2.199034 |
| 228885_at | MAMDC2 | 2.182855 |
| 227687_at | HYLS1 | 2.174374 |
| 222016_s_at | ZNF323 | 2.168375 |
| 203562_at | FEZ1 | 2.166705 |
| 201896_s_at | PSRC1 | 2.12653 |
| 200783_s_at | STMN1 | 2.124477 |

| | | |
|---|---|---|
| 202283_at | SERPINF1 | 2.108871 |
| 204962_s_at | CENPA | 2.107512 |
| 205225_at | ESR1 | 2.09808 |
| 228933_at | NHS | 2.091451 |
| 219716_at | APOL6 | 2.090762 |
| 203390_s_at | KIF3C | 2.078011 |
| 213906_at | MYBL1 | 2.076351 |
| 210538_s_at | BIRC3 | 2.073879 |
| 203638_s_at | FGFR2 | 2.070224 |
| 203018_s_at | SSX2IP | 2.064685 |
| 223307_at | CDCA3 | 2.036918 |
| 218033_s_at | SNN | 2.032911 |
| 213929_at | EXPH5 | 2.030645 |
| 228729_at | CCNB1 | 2.017431 |
| 209172_s_at | CENPF | 2.012435 |
| 201058_s_at | MYL9 | 2.010891 |
| 229068_at | CCT5 | 2.010091 |
| 232197_x_at | ARSB | 2.002876 |

**Table S3. Real-time RT-PCR primers for human histone demethylases**

| Gene Name | Forward Primers (5' – 3') | Reversed Primers (5' – 3') |
|---|---|---|
| KDM4A | CCTCACTGCGCTGTCTGTAT | CCAGTCGAAGTGAAGCACAT |
| KDM4B | CGGGTTCTATCTTTGTTTCTCTCACCCG | AAGGAAGCCTCTGGAACACCTG |
| KDM4C | GGCATAGGTGACAGGGTGTGTC | CGGGGACCAAACTCTGGAAACCCG |
| KDM4D | CGGGATCTGCACAGATTATCCACCCG | AGTTTCTGAGGAGGGCGACCA |
| KDM5A | GTTTCTTAAGGTGGCAAGTC | TCTTTTGTACTGTTCCCTAC |
| KDM5B | AGCTTTCTCAGAATGTTGGC | GCAGAGTCTGGGAATTCACA |
| KDM5C | GGGTTTCTAAAGTGTAGATCT | CCACACATCTGAGCTTTAGT |
| KDM3A | ACCTGCAGTTATTCTTCAGC | TAATGCCAGTCCTATGCCAT |
| KDM3B | TGTTCCCTGGGGACTCCTCT | GGGCACTACAGTACAGCTGG |
| JMJD1C | TTTGTTGAAGCTATTGACTG | CACTTTAACAAAAGCAAGCC |
| KDM2A | CGGATAGTTGAGAAAGCCAAGATCCG | CTCTTTGGTGGGCCTCTGTAGC |
| KDM2B | GTTAGTGGTAGTGGTGTTTTGG | AGCAGATGTGGTGTGTGGTC |
| KDM6A | CGTCCGAGTGTCAACCAACTGGACG | TGAGAGTCCTGGAGTAGGAGCAG |
| KDM6B | CTCAACTTGGGCCTCTTCTC | GCCTGTCAGATCCCAGTTCT |
| PHF2 | TCGGCACTTCTCTGTTCTCCC | AAATCCAGCCCCTCCGTGTC |
| PTH8 | CTTTCTCTACCTTGGGGACC | TAGGGACTCACGTGCTAGGG |
| JMJD4 | GGCCCTTCCAGAAATAAAGACC | CAGGCAGTGGCCATGAACAG |
| JMJD5 | GTGGGGAGAGCCCAGAAGGACATT | GACCCACCCGTTTCCCAAAA |
| HR | AGACCTCTGCCCTCTCTGCT | GCTTGGAACACAGCCCAGTC |
| FIH1AN | TTACTTAACCTCTCTGAGCC | CCAACAACCCTGAGGTAGAT |
| HSPBAP1 | ACGTAGAAGCTACACTCGAAG | TAAGCCCAGAACTTGGAATG |
| JARID2 | AAGTGCTGCTTACATCACTG | AGTGGATCATAGGACGTTCC |
| PTDSR | AGGTGGATCACTTGAGGTCA | CACCACACCTGGCTAATTTT |
| JMJD7 | GCCCAGGCCACACATAATTT | AGTGGTAGCTTTCCATGTGG |
| JHDM1D | ATCTGTGAACTTTGGAGAGG | TAGGGACTCACGTGCTAGGG |