

## Supplementary Material 5: GO processes for active module

**Article Title:** Integrative network-based analysis of mRNA and microRNA expression in 1,25-dihydroxyvitamin D3-treated cancer cells

**Journal name:** Genes & Nutrition

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| Function                                     | Group Genes   |
|--|---|
| <b>DNA catabolic process, exonucleolytic</b> | <i>BLM, DNA2, EXO1, LIG1, NEIL3, PCNA, RAD51C</i>   |
| <b>DNA duplex unwinding</b>                  | <i>BLM, DNA2, KIF18A, KIF20B, LIG1, MCM2, MCM4, MCM7, MSH5, PCNA, PIF1, POLE2, POLQ, PRIM1, RAD51, RFC3, RFC4, TK1, TOP2A</i>   |
| <b>DNA metabolic process</b>                 | <i>ASF1B, ASPM, BLM, BRCA1, BRCA2, CASC5, CCNB1, CCNE2, CDC25C, CDC45, CDC6, CDK1, CDT1, CENPA, CENPF, CENPH, CENPI, CENPK, CENPO, CENPW, CHEK2, CHTF18, DEPDC1B, DNA2, DSCC1, DTL, E2F7, E2F8, EME1, ERCC6L, ESCO2, EXO1, FANCA, FANCB, FANCD2, FANCG, FOXM1, GINS1, GINS3, GMNN, HELLS, HJURP, KIAA0101, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MKI67, MND1, MSH5, NCAPD2, NCAPG, NEIL3, NUSAP1, OIP5, ORC1, ORC6, PCNA, PIF1, PLK4, POLE2, POLQ, PRIM1, PTTG1, RAD51, RAD51AP1, RAD51C, RAD54L, RFC3, RFC4, RMI2, RRM2, SMC2, TICRR, TK1, TONSL, TOP2A, TRIP13, USP1, ZNF367</i> |
| <b>DNA packaging</b>                         | <i>ASF1B, CASC5, CCNB1, CDK1, CENPA, CENPE, CENPH, CENPI, CENPK, CENPO, CENPW, DLGAP5, DSCC1, ESPL1, GSG2, HELLS, HJURP, KIF18A, KIFC1, MCM2, MCM7, NCAPD2, NCAPG, NDC80, NEK2, NUSAP1, OIP5, PLK1, PSRC1, RAD51C, SMC2, SPAG5, TOP2A, ZWINT</i>  |
| <b>DNA repair</b>                            | <i>ATAD5, AURKB, BLM, BRCA1, BRCA2, C11orf82, CCNA2, CCNB1, CDC6, CDK1, CDT1, CHEK2, DEPDC1B, DNA2, DSCC1, DTL, E2F7, E2F8, ECT2, EME1, ERCC6L, ESCO2, EXO1, FANCA, FANCB, FANCD2, FANCG, FOXM1, GMNN, GTSE1, KIAA0101, LIG1, MCM7, MDC1, MND1, MSH5, NEIL3, NMU, PCNA, PIF1, PLK1, POLE2, POLQ, PRIM1, PTTG1, RAD51, RAD51AP1, RAD51C, RAD54L, RFC3, RFC4, SMC2, TICRR, TONSL, TOP2A, TRIP13, USP1, ZNF367</i>   |
| <b>DNA replication</b>                       | <i>AURKB, BLM, BRCA1, BRCA2, C11orf82, CCNA2, CCNB1, CCNE2, CCNF, CDC25B, CDC25C, CDC45, CDC6, CDK1, CDT1, CENPF, CENPJ, CEP152, CHEK2, CHTF18, DEPDC1B, DNA2, DSCC1, DTL, E2F7, E2F8, ECT2, ESCO2, FANCD2, FANCG, FOXM1, GINS1, GINS3, GMNN, GTSE1, KIAA0101, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, NMU, ORC1, ORC6, PCNA, PIF1, PLK4, POLE2, POLQ, PRIM1, RAD51, RAD51AP1, RAD51C, RAD54L, RFC3, RFC4, RMI2, RRM2, TICRR, TK1, TONSL, TOP2A, TRIP13, USP1</i>  |
| <b>DNA-dependent DNA replication</b>         | <i>BLM, BRCA1, BRCA2, CCNB1, CCNE2, CDC25C, CDC45, CDC6, CDK1, CDKN3, CDT1, CENPF, CHEK2, CHTF18, DNA2, DSCC1, DTL, E2F4, E2F7, E2F8, EME1, ESCO2, EXO1, FBXO5, GINS1, GINS3, GMNN, GSG2, GTSE1, IQGAP3, KIAA0101, KIF18A, KIF20B, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MND1, MSH5, NEIL3, ORC1, ORC6, PCNA, PIF1, PKMYT1, POLE2, POLQ, PRIM1, RAD51, RAD51AP1, RAD51C, RAD54L, RFC3, RFC4, RMI2, RRM2, SMC2, TICRR, TK1, TONSL, TOP2A, TRIP13</i>  |
| <b>blastocyst development</b>                | <i>BRCA2, GINS1, NEK2</i>   |
| <b>cell cycle</b>                            | <i>ANLN, ASPM, AUNIP, AURKA, AURKB, BLM, BRCA1, BRCA2, BUB1, BUB1B, C11orf82, CASC5, CCNA2, CCNB1, CCNE2, CCNF, CDC25B, CDC25C, CDC45, CDC6, CDCA2, CDCA3, CDCA7, CDCA8, CDK1, CDKN3, CDT1, CENPA, CENPE, CENPF, CENPH, CENPI, CENPJ, CENPK, CENPL, CENPM, CENPO, CENPW, CEP152, CEP55, CHEK2, CHTF18, DEPDC1B, DIAPH3, DLGAP5, DNA2, DSCC1, DTL, E2F4,</i>   |

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|   | <i>E2F7, E2F8, ECT2, ERCC6L, ESCO2, ESPL1, EXO1, FAM83D, FANCA, FANCD2, FANCG, FBXO5, FOXM1, GINS1, GMNN, GPSM2, GSG2, GTSE1, HAUS8, HELLS, HJURP, INCENP, IQGAP3, KIAA0101, KIF11, KIF15, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, KIFC1, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MELK, MKI67, MND1, MSH5, NCAPD2, NCAPG, NDC80, NEK2, NUF2, NUSAP1, OIP5, ORC1, ORC6, PBK, PCNA, PHF19, PIF1, PKMYT1, PLK1, PLK4, POLE2, PRC1, PRIM1, PSRC1, PTTG1, RACGAP1, RAD51, RAD51C, RAD54L, RBL1, RFC3, RFC4, RRM2, SGOL1, SGOL2, SKA1, SKA3, SMC2, SPAG5, SPC25, SUV39H1, TACC3, TICRR, TOP2A, TPX2, TRIP13, TTK, UBE2C, VRK1, WDHD1, ZNF367, ZWINT</i> |
| <b>cell cycle checkpoint</b>                    | <i>AURKB, BLM, BRCA1, BRCA2, BUB1, BUB1B, CASC5, CCNA2, CCNB1, CCNE2, CCNF, CDC45, CDC6, CDK1, CDT1, CENPF, CHEK2, DEPDC1B, DLGAP5, DNA2, DTL, E2F7, E2F8, ESPL1, FANCG, FBXO5, FOXM1, GSG2, GTSE1, MDC1, MKI67, PLK1, RAD51C, TICRR, TTK, UBE2C, ZNF367, ZWINT</i>   |
| <b>cell cycle phase</b>                         | <i>ASPM, AURKA, AURKB, BLM, CCNB1, CDCA8, CENPA, CENPE, CENPF, DLGAP5, ESPL1, GPSM2, GTSE1, KIF18A, KIF20B, MSH5, NDC80, NUSAP1, PSRC1, SKA1, SKA3, TACC3, TPX2</i>   |
| <b>cellular response to DNA damage stimulus</b> | <i>ASF1B, ATAD5, AURKB, BLM, BRCA1, BRCA2, C11orf82, CASC5, CCNA2, CCNB1, CCNE2, CDC25C, CDC45, CDC6, CDK1, CDT1, CENPA, CENPF, CENPH, CENPI, CENPK, CENPO, CENPW, CHEK2, CHTF18, DEPDC1B, DNA2, DSCC1, DTL, E2F7, E2F8, ECT2, EME1, ERCC6L, ESCO2, EXO1, FANCA, FANCB, FANCD2, FANCG, FOXM1, GINS1, GINS3, GMNN, GTSE1, HELLS, HJURP, KIAA0101, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MKI67, MND1, MSH5, NCAPD2, NCAPG, NEIL3, NMU, NUSAP1, OIP5, ORC1, ORC6, PCNA, PIF1, PLK1, POLE2, POLQ, PRIM1, PTTG1, RAD51, RAD51AP1, RAD51C, RAD54L, RFC3, RFC4, RMI2, RRM2, SMC2, TICRR, TK1, TONSL, TOP2A, TRIP13, USP1, ZNF367</i>                                |
| <b>chromosome organization</b>                  | <i>ANLN, ASF1B, AURKB, BLM, BRCA1, BRCA2, BUB1, CASC5, CCNB1, CDCA8, CDK1, CENPA, CENPE, CENPF, CENPH, CENPI, CENPK, CENPO, CENPW, CHEK2, DEPDC1B, DLGAP5, DNA2, DSCC1, E2F4, ESPL1, FANCD2, FBXO5, GSG2, HAUS8, HELLS, HIRIP3, HJURP, KIF11, KIF18A, KIF23, KIF24, KIFC1, LIG1, MCM2, MCM4, MCM7, MSH5, NCAPD2, NCAPG, NDC80, NEK2, NUSAP1, OIP5, PCNA, PHF19, PIF1, PLK1, POLE2, PRIM1, PSRC1, PTTG1, RACGAP1, RAD51, RAD51C, RAD54L, RBL1, RFC3, RFC4, SMC2, SPAG5, SUV39H1, TOP2A, TRIP13, WDHD1, ZWINT</i>   |
| <b>chromosome segregation</b>                   | <i>ASF1B, AURKB, BLM, BRCA1, BRCA2, BUB1, CASC5, CCNB1, CDC6, CDCA8, CDK1, CENPA, CENPE, CENPF, CENPH, CENPI, CENPK, CENPO, CENPW, DEPDC1B, DLGAP5, DNA2, DSCC1, ECT2, ESPL1, FANCD2, GSG2, HELLS, HIRIP3, HJURP, INCENP, KIF18A, KIF2C, KIFC1, LIG1, MCM2, MCM4, MCM7, MSH5, NCAPD2, NCAPG, NDC80, NEK2, NUF2, NUSAP1, OIP5, PCNA, PHF19, PIF1, PLK1, POLE2, PRIM1, PSRC1, PTTG1, RACGAP1, RAD51, RAD51C, RAD54L, RBL1, RFC3, RFC4, SGOL1, SGOL2, SKA1, SKA3, SMC2, SPAG5, SPC25, SUV39H1, TOP2A, TRIP13, WDHD1, ZWINT</i>   |
| <b>cytoskeleton organization</b>                | <i>ANLN, ASPM, AUNIP, AURKA, AURKB, BRCA1, BRCA2, BUB1, BUB1B, CASC5, CCNB1, CCNF, CDC25B, CDC25C, CDC6, CDK1, CENPA, CENPF, CENPJ, CEP152, CHEK2, DIAPH3, DLGAP5, ECT2, ESPL1, FBXO5, GPSM2, HAUS8, KIAA0101, KIF11, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, NCAPG, NDC80, NEK2, NUSAP1, PHF19, PIF1, PKMYT1, PLK1, PLK4, PRC1, PSRC1, RACGAP1, SGOL1, SKA1, SKA3, SPAG5, SPC25, TACC3, TONSL, TPX2, TTK, UBE2C, WDHD1, ZWINT</i>   |
| <b>meiosis I</b>                                | <i>BRCA2, CDC25B, ESPL1, FANCA, FANCD2, FBXO5, LIG1, MSH5, RAD51, RAD51C, SGOL1, SMC2, TOP2A, TRIP13</i>  |
| <b>meiotic nuclear division</b>                 | <i>ASPM, AURKA, BRCA2, C11orf82, CASC5, CCNB1, CDC25B, CDK1, CHEK2, DLGAP5, ESPL1, EXO1, FANCA, FANCD2, FANCG, FBXO5, FOXM1, MKI67, MND1, MSH5, NEK2, NUSAP1, PLK1, PSRC1, RAD51, RAD51C, RAD54L, SGOL1, SGOL2, SMC2, TK1, TOP2A, TRIP13, VRK1</i>  |
| <b>microtubule bundle formation</b>             | <i>KIF20A, PLK1, PSRC1</i>  |
| <b>microtubule cytoskeleton organization</b>    | <i>ANLN, ASPM, AUNIP, AURKA, AURKB, BLM, BRCA1, BRCA2, BUB1, BUB1B, C11orf82, CASC5, CCNA2, CCNB1, CCNE2, CCNF, CDC25B, CDC25C, CDC45, CDC6, CDK1, CDKN3, CDT1, CENPA, CENPF, CENPJ, CEP152, CEP55, CHEK2, DEPDC1B, DIAPH3, DLGAP5, DNA2, DTL, E2F4, E2F7, E2F8, ECT2, ESPL1, FANCG, FBXO5, FOXM1, GMNN, GPSM2, GSG2, GTSE1, HAUS8, INCENP, IQGAP3, KIAA0101,</i>   |

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|  | <i>KIF11, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MELK, NCAPG, NDC80, NEK2, NUSAP1, ORC1, ORC6, PCNA, PHF19, PIF1, PKMYT1, PLK1, PLK4, POLE2, PRC1, PRIM1, PSRC1, PTTG1, RACGAP1, RAD51C, RBL1, RRM2, SGOL1, SKA1, SKA3, SPAG5, SPC25, TACC3, TICRR, TK1, TPX2, TTK, UBE2C, VRK1, WDHD1, ZNF367, ZWINT</i>   |
| <b>microtubule polymerization</b>                          | <i>CENPJ, FBXO5, PSRC1</i>   |
| <b>microtubule-based process</b>                           | <i>ANLN, AUNIP, AURKA, AURKB, BRCA1, BRCA2, BUB1B, CASC5, CCNB1, CCNF, CDK1, CENPA, CENPE, CENPJ, CEP152, CHEK2, DIAPH3, DLGAP5, ECT2, ESPL1, FBXO5, GPSM2, GTSE1, HAUS8, KIAA0101, KIF11, KIF14, KIF15, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, KIF4A, KIFC1, NCAPG, NDC80, NEK2, NUSAP1, PLK1, PLK4, PRC1, PSRC1, RACGAP1, SGOL1, SKA1, SKA3, SPAG5, SPC25, TACC3, TPX2, TTK, UBE2C, ZWINT</i>  |
| <b>mismatch repair</b>                                     | <i>EXO1, MSH5, PCNA</i>  |
| <b>mitotic cell cycle</b>                                  | <i>ANLN, ASF1B, ASPM, AUNIP, AURKA, AURKB, BLM, BRCA1, BRCA2, BUB1, BUB1B, C11orf82, CASC5, CCNA2, CCNB1, CCNE2, CCNF, CDC25B, CDC25C, CDC45, CDC6, CDCA2, CDCA3, CDCA7, CDCA8, CDK1, CDKN3, CDT1, CENPA, CENPE, CENPF, CENPH, CENPI, CENPJ, CENPK, CENPL, CENPM, CENPO, CENPW, CEP152, CEP55, CHEK2, DEPDC1B, DIAPH3, DLGAP5, DNA2, DSCC1, DTL, E2F4, E2F7, E2F8, ECT2, ERCC6L, ESCO2, ESPL1, EXO1, FAM83D, FANCA, FANCD2, FANCG, FBXO5, FOXM1, GINS1, GMNN, GPSM2, GSG2, GTSE1, HAUS8, HELLS, HIRIP3, HJURP, INCENP, IQGAP3, KIAA0101, KIF11, KIF14, KIF15, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, KIF4A, KIFC1, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MELK, MKI67, MND1, MSH5, NCAPD2, NCAPG, NDC80, NEK2, NUF2, NUSAP1, OIP5, ORC1, ORC6, PBK, PCNA, PHF19, PIF1, PKMYT1, PLK1, PLK4, POLE2, PRC1, PRIM1, PSRC1, PTTG1, RACGAP1, RAD51, RAD51C, RAD54L, RBL1, RFC3, RFC4, RRM2, SGOL1, SGOL2, SKA1, SKA3, SMC2, SPAG5, SPC25, SUV39H1, TACC3, TICRR, TK1, TOP2A, TPX2, TRIP13, TTK, UBE2C, VRK1, WDHD1, ZNF367, ZWINT</i> |
| <b>mitotic cell cycle phase transition</b>                 | <i>AURKA, BLM, BRCA2, BUB1, BUB1B, CCNA2, CCNB1, CCNE2, CDC25B, CDC25C, CDC45, CDC6, CDK1, CDKN3, CDT1, CENPF, CENPJ, CEP152, CHEK2, DLGAP5, DNA2, E2F4, E2F7, E2F8, ESPL1, FBXO5, FOXM1, GINS1, GSG2, GTSE1, IQGAP3, LIG1, LIN9, MCM10, MCM2, MCM3, MCM4, MCM7, MDC1, MELK, NEK2, ORC1, ORC6, PCNA, PKMYT1, PLK1, PLK4, POLE2, POLQ, PRIM1, RAD51, RAD51C, RFC3, RFC4, RRM2, TICRR, TK1, TONSL, TOP2A, TTK, UBE2C, ZWINT</i>  |
| <b>mitotic recombination</b>                               | <i>BLM, DNA2, LIG1, MSH5, PCNA, POLE2, PRIM1, RAD51, RAD51C, RFC3, RFC4, TOP2A, TRIP13</i>   |
| <b>mitotic sister chromatid segregation</b>                | <i>ASPM, AURKA, BRCA2, BUB1B, CCNB1, CDC25B, CDK1, CENPA, CENPE, CENPF, DLGAP5, DSCC1, ESPL1, GPSM2, GSG2, KIF18A, KIFC1, NCAPD2, NCAPG, NDC80, NEK2, NUSAP1, PLK1, PSRC1, RAD51C, SMC2, SPAG5, TACC3, TOP2A, ZWINT</i>  |
| <b>mitotic spindle organization</b>                        | <i>AURKA, AURKB, BRCA1, BUB1, BUB1B, CASC5, CCNB1, CCNF, CDK1, CENPE, CENPF, CENPJ, CHEK2, ECT2, ESPL1, FBXO5, GSG2, KIF11, KIF18A, KIF18B, KIF23, KIF24, KIF2C, NCAPG, NDC80, NEK2, PHF19, PIF1, PLK1, PLK4, PRC1, PSRC1, PTTG1, RACGAP1, SKA1, SKA3, SPAG5, SPC25, TACC3, TPX2, TTK, UBE2C</i>   |
| <b>negative regulation of organelle organization</b>       | <i>AURKA, AURKB, BRCA1, BUB1, BUB1B, CCNB1, CCNF, CENPF, ESPL1, FBXO5, NCAPG, PHF19, PIF1, PLK1, TTK, UBE2C, WDHD1</i>   |
| <b>neural precursor cell proliferation</b>                 | <i>ASPM, MELK, RACGAP1, SHCBP1, TACC3</i>  |
| <b>peptidyl-tyrosine dephosphorylation</b>                 | <i>CDC25B, CDC25C, CDKN3, ZNF367</i>   |
| <b>phosphatidylinositol-mediated signaling</b>             | <i>AURKA, BUB1B, NDC80, PCNA, RFC4, SPAG5, TOP2A, UBE2C, ZWINT</i>   |
| <b>regulation of G2/M transition of mitotic cell cycle</b> | <i>CCNA2, CDK1, CENPF, CHEK2, GTSE1, MDC1, MKI67, RAD51C, TICRR</i>  |
| <b>regulation of cell cycle process</b>                    | <i>ANLN, ASPM, AUNIP, AURKA, AURKB, BLM, BRCA1, BRCA2, BUB1, BUB1B, CASC5, CCNA2, CCNB1, CCNF, CDC25B, CDC25C, CDC6, CDK1, CDT1, CENPA, CENPE, CENPF, CENPH, CENPJ, CENPW, CEP55, CHEK2, DLGAP5, E2F4, E2F7, E2F8, ECT2, ESPL1, FBXO5,</i>   |

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|  | <i>FOXM1, GPSM2, GSG2, GTSE1, HAUS8, INCENP, KIF11, KIF14, KIF15, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, KIF4A, KIFC1, MDC1, NDC80, NEK2, NUSAP1, PKMYT1, PLK1, PLK4, PRC1, PSRC1, RACGAP1, RAD51C, SPAG5, SPC25, TACC3, TICRR, TPX2, TTK, UBE2C, ZWINT</i>  |
| <b>regulation of cyclin-dependent protein serine/threonine kinase activity</b> | <i>BLM, CCNA2, CCNB1, CCNE2, CDC25C, CDC6, CDKN3, MCM2, PKMYT1, PLK1, PSRC1</i>  |
| <b>regulation of microtubule cytoskeleton organization</b>                     | <i>AURKA, AURKB, BRCA1, BRCA2, CCNB1, CCNF, CDK1, CENPJ, CEP152, ECT2, FOXM1, HAUS8, KIAA0101, KIF11, NCAPG, NEK2, PLK1, PLK4, PSRC1, RACGAP1, SGOL1, SKA1, SKA3, SPAG5, TACC3, TPX2</i>   |
| <b>response to ionizing radiation</b>  | <i>BLM, BRCA1, BRCA2, C11orf82, CDK1, CHEK2, DEPDC1B, ECT2, FANCD2, FOXM1, RAD51, RAD51AP1, RAD54L, TICRR</i>  |
| <b>response to radiation</b>   | <i>AURKB, BLM, BRCA1, BRCA2, C11orf82, CHEK2, DEPDC1B, DTL, ECT2, FANCD2, FANCG, KIAA0101, NMU, PCNA, POLQ, RAD51, RAD51AP1, RAD54L, RFC3, TICRR, USP1</i>   |
| <b>single-organism organelle organization</b>                                  | <i>ANLN, ASPM, AUNIP, AURKA, AURKB, BLM, BRCA1, BRCA2, BUB1, BUB1B, CASC5, CCNA2, CCNB1, CCNF, CDC25B, CDC25C, CDC6, CDCA2, CDCA3, CDCA8, CDK1, CENPA, CENPE, CENPF, CENPJ, CENPW, CEP152, CEP55, CHEK2, DEPDC1B, DIAPH3, DLGAP5, DNA2, DSCC1, ECT2, ERCC6L, ESPL1, FAM83D, FANCD2, FBXO5, GPSM2, GSG2, GTSE1, HAUS8, HELLS, INCENP, KIAA0101, KIF11, KIF14, KIF15, KIF18A, KIF18B, KIF20A, KIF20B, KIF23, KIF24, KIF2C, KIF4A, KIFC1, LIG1, MSH5, NCAPD2, NCAPG, NDC80, NEK2, NUF2, NUSAP1, OIP5, PBK, PCNA, PHF19, PIF1, PKMYT1, PLK1, PLK4, POLE2, PRC1, PRIM1, PSRC1, PTTG1, RACGAP1, RAD51, RAD51C, RFC3, RFC4, SGOL1, SKA1, SKA3, SMC2, SPAG5, SPC25, TACC3, TOP2A, TPX2, TRIP13, TTK, UBE2C, VRK1, WDHD1, ZWINT</i> |
| <b>sister chromatid cohesion</b>   | <i>BUB1, DSCC1, ESPL1, GSG2, RAD51C</i>  |
| <b>sister chromatid segregation</b>  | <i>ASPM, AURKB, BRCA1, BUB1, CASC5, CCNB1, CDC6, CDK1, CENPA, CENPE, CENPF, CENPW, DLGAP5, DSCC1, ECT2, ESPL1, GPSM2, GSG2, HJURP, INCENP, KIF18A, KIF2C, KIFC1, MSH5, NCAPD2, NCAPG, NDC80, NEK2, NUF2, NUSAP1, PLK1, PSRC1, PTTG1, RACGAP1, RAD51C, SGOL1, SGOL2, SKA1, SKA3, SMC2, SPAG5, SPC25, TACC3, TOP2A, ZWINT</i>  |
| <b>spindle assembly involved in mitosis</b>                                    | <i>ANLN, AURKB, CASC5, CENPA, CENPE, CENPF, CENPH, CENPW, CHEK2, E2F4, FBXO5, HAUS8, KIF11, KIF23, KIF24, NEK2, RACGAP1, SMC2</i>  |
| <b>spindle checkpoint</b>  | <i>AURKA, AURKB, BUB1, BUB1B, CASC5, CCNB1, CDK1, CENPA, CENPF, ESPL1, FBXO5, GPSM2, GSG2, NDC80, NUSAP1, PLK1, PTTG1, TTK, UBE2C, ZNF367</i>  |
| <b>spindle organization</b>  | <i>AUNIP, AURKA, AURKB, BUB1B, CASC5, CCNB1, CHEK2, ECT2, ESPL1, FBXO5, HAUS8, KIF11, KIF23, NDC80, NEK2, PRC1, PSRC1, RACGAP1, SGOL1, SPAG5, SPC25, TACC3, TPX2, TTK, UBE2C, ZWINT</i>  |