

## Clinical relevance of cell proliferation-related pathways in pancreatic cancer

**Table S1.** Member genes of the Hallmark proliferation-related pathway gene sets

---

**G2M checkpoint:** ABL1, AC027237.1, AC091021.1, AMD1, ARID4A, ATF5, ATRX, AURKA, AURKB, BARD1, BCL3, BIRC5, BRCA2, BUB1, BUB3, CASP8AP2, CBX1, CCNA2, CCNB2, CCND1, CCNF, CCNT1, CDC20, CDC25A, CDC25B, CDC27, CDC45, CDC6, CDC7, CDK1, CDK4, CDKN1B, CDKN2C, CDKN3, CENPA, CENPE, CENPF, CHAF1A, CHEK1, CHMP1A, CKS1B, CKS2, CTCF, CUL1, CUL3, CUL4A, CUL5, DBF4, DDX39A, DKC1, DMD, DR1, DTYMK, E2F1, E2F2, E2F3, E2F4, EFNA5, EGF, ESPL1, EWSR1, EXO1, EZH2, FANCC, FBXO5, FOXN3, G3BP1, GINS2, GSPT1, H2AFV, H2AFX, H2AFZ, HIF1A, HIRA, HIST1H2BK, HMGA1, HMGB3, HMGN2, HMMR, HNRNPB, HNRNPU, HOXC10, HSPA8, HUS1, ILF3, INCENP, JPT1, KATNA1, KIF11, KIF15, KIF20B, KIF22, KIF2C, KIF4A, KIF5B, KMT5A, KNL1, KPNA2, KPNB1, LBR, LIG3, LMNB1, MAD2L1, MAP3K20, MAPK14, MARCKS, MCM2, MCM3, MCM5, MCM6, MEIS1, MEIS2, MKI67, MNAT1, MT2A, MTF2, MYBL2, MYC, NASP, NCL, NDC80, NEK2, NOLC1, NOTCH2, NSD2, NUMA1, NUP50, NUP98, NUSAP1, ODC1, ODF2, ORC5, ORC6, PAFAH1B1, PBK, PDS5B, PLK1, PLK4, PML, POLA2, POLE, POLQ, PRC1, PRIM2, PRMT5, PRPF4B, PTTG1, PTTG3P, PURA, RACGAP1, RAD21, RAD23B, RAD54L, SASAL2, RBL1, RBM14, RPA2, RPS6KA5, SAP30, SFPQ, SLC12A2, SLC38A1, SLC7A1, SLC7A5, SMAD3, SMARCC1, SMC1A, SMC2, SMC4, SNRPD1, SQLE, SRSF1, SRSF10, SRSF2, STAG1, STIL, STMN1, SUV39H1, SYNCNIP, TACC3, TENT4A, TFDP1, TGFB1, TLE3, TMPO, TNPO2, TOP1, TOP2A, TPX2, TRA2B, TRAP1, TRRAP, TTK, UBE2C, UBE2S, UCK2, UPP1, WRN, XPO1, YTHDC1

**E2F Targets:** AK2, ANP32E, ASF1A, ASF1B, ATAD2, AURKA, AURKB, BARD1, BIRC5, BRCA1, BRCA2, BRMS1L, BUB1B, CBX5, CCNB2, CCNE1, CCP110, CDC20, CDC25A, CDC25B, CDCA3, CDCA8, CDK1, CDK4, CDKN1A, CDKN1B, CDKN2A, CDKN2C, CDKN3, CENPE, CENPM, CHEK1, CHEK2, CIT, CKS1B, CKS2, CNOT9, CSE1L, CTCF, CTSP1, DCK, DCLRE1B, DCTPP1, DDX39A, DEK, DEPDC1, DIAPH3, DLGAP5, DNMT1, DONSON, DSCC1, DUT, E2F8, EED, EIF2S1, ESPL1, EXOSC8, EZH2, GINS1, GINS3, GINS4, GSPT1, H2AFX, H2AFZ, HELLS, HMGA1, HMGB2, HMGB3, HMMR, HNRNPB, HUS1, ILF3, ING3, IPO7, JPT1, KIF18B, KIF22, KIF2C, KIF4A, KPNA2, LBR, LIG1, LMNB1, LUC7L3, LYAR, MAD2L1, MCM2, MCM3, MCM4, MCM5, MCM6, MCM7, MELK, MKI67, MLH1, MMS22L, MRE11, MSH2, MTHFD2, MXD3, MYBL2, MYC, NAA38, NAP1L1, NASP, NBN, NCPAD2, NME1, NOLC1, NOP56, NUDT21, NUP107, NUP153, NUP205, ORC2, ORC6, PA2G4, PAICS, PAN2, PCNA, PDS5B, PHF5A, PLK1, PLK4, PMS2, PNN, POLA2, POLD1, POLD2, POLD3, POLE, POLE4, POP7, PPM1D, PPP1R8, PRDX4, PRIM2, PRKDC, PRPS1, PSIP1, PSMC3IP, PTTG1, RACGAP1, RAD1, RAD21, RAD50, RAD51AP1, RAD51C, RAN, RANBP1, RBBP7, RFC1, RFC2, RFC3, RNASEH2A, RPA1, RPA2, RPA3, RRM2, SHMT1, SLBP, SMC1A, SMC3, SMC4, SMC6, SNRPB, SPAG5, SPC24, SPC25, SRSF1, SRSF2, SSRP1, STAG1, STMN1, SUV39H1, SYNCNIP, TACC3, TBRG4, TCF19, TFRC, TIMELESS, TIPIN, TK1, TMPO, TOP2A, TP53, TRA2B, TRIP13, TUBB, TUBG1, UBE2S, UBE2T, UBR7, UNG, USP1, WDR90, WEE1, XPO1, XRCC6, ZW10

**MYC Targets V1:** ABCE1, AC004086.1, ACP1, AIMP2, AP3S1, APEX1, BUB3, C1QBP, CAD, CANX, CBX3, CCNA2, CCT2, CCT3, CCT4, CCT5, CCT7, CDC20, CDC45, CDK2, CDK4, CLNS1A, CNBP, COPS5, COX5A, CSTF2, CTSP1, CUL1, CYC1, DDX18, DDX21, DEK, DHX15, DUT, EEF1B2, EIF1AX, EIF2S1, EIF2S2, EIF3B, EIF3D, EIF3J, EIF4A1, EIF4E, EIF4G2, EIF4H, EPRS, ERH, ETF1, EXOSC7, FAM120A, FBL, G3BP1, GLO1, GNL3, GOT2, GSPT1, H2AFZ, HDAC2, HDCC2, HDGF, HNRNPA1, HNRNPA2B1, HNRNPA3, HNRNPC, HNRNPB, HNRNPR, HNRNPU, HPRT1, HSP90AB1, HSPD1, HSPE1, IARS, IFRD1, ILF2, IMPDH2, KARS, KPNA2, KPNB1, LDHA, LSM2, LSM7, MAD2L1, MCM2, MCM4, MCM5, MCM6, MCM7, MRPL23, MRPL9, MRPS18B, MYC, NAP1L1, NCBP1, NCBP2, NDUFB1, NHP2, NME1, NOLC1, NOP16, NOP56, NPM1, ODC1, ORC2, PA2G4, PABPC1, PABPC4, PCBP1, PCNA, PGK1, PHB, PHB2, POLD2, POLE3, PPIA, PPM1G, PRDX3, PRDX4, PRPF31, PRPS2, PSMA1, PSMA2, PSMA4, PSMA6, PSMA7, PSMB2, PSMB3, PSMC4, PSMC6, PSMC1, PSMC14, PSMC15, PSMC18, PSMC19, PSMC20, PSMC21, PSMC22, PSMC23, PSMC24, PSMC25, PSMC26, PSMC27, PSMC28, PSMC29, PSMC30, PSMC31, PSMC32, PSMC33, PSMC34, PSMC35, PSMC36, PSMC37, PSMC38, PSMC39, PSMC40, PSMC41, PSMC42, PSMC43, PSMC44, PSMC45, PSMC46, PSMC47, PSMC48, PSMC49, PSMC50, PSMC51, PSMC52, PSMC53, PSMC54, PSMC55, PSMC56, PSMC57, PSMC58, PSMC59, PSMC60, PSMC61, PSMC62, PSMC63, PSMC64, PSMC65, PSMC66, PSMC67, PSMC68, PSMC69, PSMC70, PSMC71, PSMC72, PSMC73, PSMC74, PSMC75, PSMC76, PSMC77, PSMC78, PSMC79, PSMC80, PSMC81, PSMC82, PSMC83, PSMC84, PSMC85, PSMC86, PSMC87, PSMC88, PSMC89, PSMC90, PSMC91, PSMC92, PSMC93, PSMC94, PSMC95, PSMC96, PSMC97, PSMC98, PSMC99, PSMC100, PSMC101, PSMC102, PSMC103, PSMC104, PSMC105, PSMC106, PSMC107, PSMC108, PSMC109, PSMC110, PSMC111, PSMC112, PSMC113, PSMC114, PSMC115, PSMC116, PSMC117, PSMC118, PSMC119, PSMC120, PSMC121, PSMC122, PSMC123, PSMC124, PSMC125, PSMC126, PSMC127, PSMC128, PSMC129, PSMC130, PSMC131, PSMC132, PSMC133, PSMC134, PSMC135, PSMC136, PSMC137, PSMC138, PSMC139, PSMC140, PSMC141, PSMC142, PSMC143, PSMC144, PSMC145, PSMC146, PSMC147, PSMC148, PSMC149, PSMC150, PSMC151, PSMC152, PSMC153, PSMC154, PSMC155, PSMC156, PSMC157, PSMC158, PSMC159, PSMC160, PSMC161, PSMC162, PSMC163, PSMC164, PSMC165, PSMC166, PSMC167, PSMC168, PSMC169, PSMC170, PSMC171, PSMC172, PSMC173, PSMC174, PSMC175, PSMC176, PSMC177, PSMC178, PSMC179, PSMC180, PSMC181, PSMC182, PSMC183, PSMC184, PSMC185, PSMC186, PSMC187, PSMC188, PSMC189, PSMC190, PSMC191, PSMC192, PSMC193, PSMC194, PSMC195, PSMC196, PSMC197, PSMC198, PSMC199, PSMC200, PSMC201, PSMC202, PSMC203, PSMC204, PSMC205, PSMC206, PSMC207, PSMC208, PSMC209, PSMC210, PSMC211, PSMC212, PSMC213, PSMC214, PSMC215, PSMC216, PSMC217, PSMC218, PSMC219, PSMC220, PSMC221, PSMC222, PSMC223, PSMC224, PSMC225, PSMC226, PSMC227, PSMC228, PSMC229, PSMC230, PSMC231, PSMC232, PSMC233, PSMC234, PSMC235, PSMC236, PSMC237, PSMC238, PSMC239, PSMC240, PSMC241, PSMC242, PSMC243, PSMC244, PSMC245, PSMC246, PSMC247, PSMC248, PSMC249, PSMC250, PSMC251, PSMC252, PSMC253, PSMC254, PSMC255, PSMC256, PSMC257, PSMC258, PSMC259, PSMC260, PSMC261, PSMC262, PSMC263, PSMC264, PSMC265, PSMC266, PSMC267, PSMC268, PSMC269, PSMC270, PSMC271, PSMC272, PSMC273, PSMC274, PSMC275, PSMC276, PSMC277, PSMC278, PSMC279, PSMC280, PSMC281, PSMC282, PSMC283, PSMC284, PSMC285, PSMC286, PSMC287, PSMC288, PSMC289, PSMC290, PSMC291, PSMC292, PSMC293, PSMC294, PSMC295, PSMC296, PSMC297, PSMC298, PSMC299, PSMC300, PSMC301, PSMC302, PSMC303, PSMC304, PSMC305, PSMC306, PSMC307, PSMC308, PSMC309, PSMC310, PSMC311, PSMC312, PSMC313, PSMC314, PSMC315, PSMC316, PSMC317, PSMC318, PSMC319, PSMC320, PSMC321, PSMC322, PSMC323, PSMC324, PSMC325, PSMC326, PSMC327, PSMC328, PSMC329, PSMC330, PSMC331, PSMC332, PSMC333, PSMC334, PSMC335, PSMC336, PSMC337, PSMC338, PSMC339, PSMC340, PSMC341, PSMC342, PSMC343, PSMC344, PSMC345, PSMC346, PSMC347, PSMC348, PSMC349, PSMC350, PSMC351, PSMC352, PSMC353, PSMC354, PSMC355, PSMC356, PSMC357, PSMC358, PSMC359, PSMC360, PSMC361, PSMC362, PSMC363, PSMC364, PSMC365, PSMC366, PSMC367, PSMC368, PSMC369, PSMC370, PSMC371, PSMC372, PSMC373, PSMC374, PSMC375, PSMC376, PSMC377, PSMC378, PSMC379, PSMC380, PSMC381, PSMC382, PSMC383, PSMC384, PSMC385, PSMC386, PSMC387, PSMC388, PSMC389, PSMC390, PSMC391, PSMC392, PSMC393, PSMC394, PSMC395, PSMC396, PSMC397, PSMC398, PSMC399, PSMC400, PSMC401, PSMC402, PSMC403, PSMC404, PSMC405, PSMC406, PSMC407, PSMC408, PSMC409, PSMC410, PSMC411, PSMC412, PSMC413, PSMC414, PSMC415, PSMC416, PSMC417, PSMC418, PSMC419, PSMC420, PSMC421, PSMC422, PSMC423, PSMC424, PSMC425, PSMC426, PSMC427, PSMC428, PSMC429, PSMC430, PSMC431, PSMC432, PSMC433, PSMC434, PSMC435, PSMC436, PSMC437, PSMC438, PSMC439, PSMC440, PSMC441, PSMC442, PSMC443, PSMC444, PSMC445, PSMC446, PSMC447, PSMC448, PSMC449, PSMC450, PSMC451, PSMC452, PSMC453, PSMC454, PSMC455, PSMC456, PSMC457, PSMC458, PSMC459, PSMC460, PSMC461, PSMC462, PSMC463, PSMC464, PSMC465, PSMC466, PSMC467, PSMC468, PSMC469, PSMC470, PSMC471, PSMC472, PSMC473, PSMC474, PSMC475, PSMC476, PSMC477, PSMC478, PSMC479, PSMC480, PSMC481, PSMC482, PSMC483, PSMC484, PSMC485, PSMC486, PSMC487, PSMC488, PSMC489, PSMC490, PSMC491, PSMC492, PSMC493, PSMC494, PSMC495, PSMC496, PSMC497, PSMC498, PSMC499, PSMC500, PSMC501, PSMC502, PSMC503, PSMC504, PSMC505, PSMC506, PSMC507, PSMC508, PSMC509, PSMC510, PSMC511, PSMC512, PSMC513, PSMC514, PSMC515, PSMC516, PSMC517, PSMC518, PSMC519, PSMC520, PSMC521, PSMC522, PSMC523, PSMC524, PSMC525, PSMC526, PSMC527, PSMC528, PSMC529, PSMC530, PSMC531, PSMC532, PSMC533, PSMC534, PSMC535, PSMC536, PSMC537, PSMC538, PSMC539, PSMC540, PSMC541, PSMC542, PSMC543, PSMC544, PSMC545, PSMC546, PSMC547, PSMC548, PSMC549, PSMC550, PSMC551, PSMC552, PSMC553, PSMC554, PSMC555, PSMC556, PSMC557, PSMC558, PSMC559, PSMC560, PSMC561, PSMC562, PSMC563, PSMC564, PSMC565, PSMC566, PSMC567, PSMC568, PSMC569, PSMC570, PSMC571, PSMC572, PSMC573, PSMC574, PSMC575, PSMC576, PSMC577, PSMC578, PSMC579, PSMC580, PSMC581, PSMC582, PSMC583, PSMC584, PSMC585, PSMC586, PSMC587, PSMC588, PSMC589, PSMC590, PSMC591, PSMC592, PSMC593, PSMC594, PSMC595, PSMC596, PSMC597, PSMC598, PSMC599, PSMC600, PSMC601, PSMC602, PSMC603, PSMC604, PSMC605, PSMC606, PSMC607, PSMC608, PSMC609, PSMC610, PSMC611, PSMC612, PSMC613, PSMC614, PSMC615, PSMC616, PSMC617, PSMC618, PSMC619, PSMC620, PSMC621, PSMC622, PSMC623, PSMC624, PSMC625, PSMC626, PSMC627, PSMC628, PSMC629, PSMC630, PSMC631, PSMC632, PSMC633, PSMC634, PSMC635, PSMC636, PSMC637, PSMC638, PSMC639, PSMC640, PSMC641, PSMC642, PSMC643, PSMC644, PSMC645, PSMC646, PSMC647, PSMC648, PSMC649, PSMC650, PSMC651, PSMC652, PSMC653, PSMC654, PSMC655, PSMC656, PSMC657, PSMC658, PSMC659, PSMC660, PSMC661, PSMC662, PSMC663, PSMC664, PSMC665, PSMC666, PSMC667, PSMC668, PSMC669, PSMC670, PSMC671, PSMC672, PSMC673, PSMC674, PSMC675, PSMC676, PSMC677, PSMC678, PSMC679, PSMC680, PSMC681, PSMC682, PSMC683, PSMC684, PSMC685, PSMC686, PSMC687, PSMC688, PSMC689, PSMC690, PSMC691, PSMC692, PSMC693, PSMC694, PSMC695, PSMC696, PSMC697, PSMC698, PSMC699, PSMC700, PSMC701, PSMC702, PSMC703, PSMC704, PSMC705, PSMC706, PSMC707, PSMC708, PSMC709, PSMC710, PSMC711, PSMC712, PSMC713, PSMC714, PSMC715, PSMC716, PSMC717, PSMC718, PSMC719, PSMC720, PSMC721, PSMC722, PSMC723, PSMC724, PSMC725, PSMC726, PSMC727, PSMC728, PSMC729, PSMC730, PSMC731, PSMC732, PSMC733, PSMC734, PSMC735, PSMC736, PSMC737, PSMC738, PSMC739, PSMC740, PSMC741, PSMC742, PSMC743, PSMC744, PSMC745, PSMC746, PSMC747, PSMC748, PSMC749, PSMC750, PSMC751, PSMC752, PSMC753, PSMC754, PSMC755, PSMC756, PSMC757, PSMC758, PSMC759, PSMC760, PSMC761, PSMC762, PSMC763, PSMC764, PSMC765, PSMC766, PSMC767, PSMC768, PSMC769, PSMC770, PSMC771, PSMC772, PSMC773, PSMC774, PSMC775, PSMC776, PSMC777, PSMC778, PSMC779, PSMC780, PSMC781, PSMC782, PSMC783, PSMC784, PSMC785, PSMC786, PSMC787, PSMC788, PSMC789, PSMC790, PSMC791, PSMC792, PSMC793, PSMC794, PSMC795, PSMC796, PSMC797, PSMC798, PSMC799, PSMC800, PSMC801, PSMC802, PSMC803, PSMC804, PSMC805, PSMC806, PSMC807, PSMC808, PSMC809, PSMC810, PSMC811, PSMC812, PSMC813, PSMC814, PSMC815, PSMC816, PSMC817, PSMC818, PSMC819, PSMC820, PSMC821, PSMC822, PSMC823, PSMC824, PSMC825, PSMC826, PSMC827, PSMC828, PSMC829, PSMC830, PSMC831, PSMC832, PSMC833, PSMC834, PSMC835, PSMC836, PSMC837, PSMC838, PSMC839, PSMC840, PSMC841, PSMC842, PSMC843, PSMC844, PSMC845, PSMC846, PSMC847, PSMC848, PSMC849, PSMC850, PSMC851, PSMC852, PSMC853, PSMC854, PSMC855, PSMC856, PSMC857, PSMC858, PSMC859, PSMC860, PSMC861, PSMC862, PSMC863, PSMC864, PSMC865, PSMC866, PSMC867, PSMC868, PSMC869, PSMC870, PSMC871, PSMC872, PSMC873, PSMC874, PSMC875, PSMC876, PSMC877, PSMC878, PSMC879, PSMC880, PSMC881, PSMC882, PSMC883, PSMC884, PSMC885, PSMC886, PSMC887, PSMC888, PSMC889, PSMC890, PSMC891, PSMC892, PSMC893, PSMC894, PSMC895, PSMC896, PSMC897, PSMC898, PSMC899, PSMC900, PSMC901, PSMC902, PSMC903, PSMC904, PSMC905, PSMC906, PSMC907, PSMC908, PSMC909, PSMC910, PSMC911, PSMC912, PSMC913, PSMC914, PSMC915, PSMC916, PSMC917, PSMC918, PSMC919, PSMC920, PSMC921, PSMC922, PSMC923, PSMC924, PSMC925, PSMC926, PSMC927, PSMC928, PSMC929, PSMC930, PSMC931, PSMC932, PSMC933, PSMC934, PSMC935, PSMC936, PSMC937, PSMC938, PSMC939, PSMC940, PSMC941, PSMC942, PSMC943, PSMC944, PSMC945, PSMC946, PSMC947, PSMC948, PSMC949, PSMC950, PSMC951, PSMC952, PSMC953, PSMC954, PSMC955, PSMC956, PSMC957, PSMC958, PSMC959, PSMC960, PSMC961, PSMC962, PSMC963, PSMC964, PSMC965, PSMC966, PSMC967, PSMC968, PSMC969, PSMC970, PSMC971, PSMC972, PSMC973, PSMC974, PSMC975, PSMC976, PSMC977, PSMC978, PSMC979, PSMC980, PSMC981, PSMC982, PSMC983, PSMC984, PSMC985, PSMC986, PSMC987, PSMC988, PSMC989, PSMC990, PSMC991, PSMC992, PSMC993, PSMC994, PSMC995, PSMC996, PSMC997, PSMC998, PSMC999, PSMC1000, PSMC1001, PSMC1002, PSMC1003, PSMC1004, PSMC1005, PSMC1006, PSMC1007, PSMC1008, PSMC1009, PSMC1010, PSMC1011, PSMC1012, PSMC1013, PSMC1014, PSMC1015, PSMC1016, PSMC1017, PSMC1018, PSMC1019, PSMC1020, PSMC1021, PSMC1022, PSMC1023, PSMC1024, PSMC1025, PSMC1026, PSMC1027, PSMC1028, PSMC1029, PSMC1030, PSMC1031, PSMC1032, PSMC1033, PSMC1034, PSMC1035, PSMC1036, PSMC1037, PSMC1038, PSMC1039, PSMC1040, PSMC1041, PSMC1042, PSMC1043, PSMC1044, PSMC1045, PSMC1046, PSMC1047, PSMC1048, PSMC1049, PSMC1050, PSMC1051, PSMC1052, PSMC1053, PSMC1054, PSMC1055, PSMC1056, PSMC1057, PSMC1058, PSMC1059, PSMC1060, PSMC1061, PSMC1062, PSMC1063, PSMC1064, PSMC1065, PSMC1066, PSMC1067, PSMC1068, PSMC1069, PSMC1070, PSMC1071, PSMC1072, PSMC1073, PSMC1074, PSMC1075, PSMC1076, PSMC1077, PSMC1078, PSMC1079, PSMC1080, PSMC1081, PSMC1082, PSMC1083, PSMC1084, PSMC1085, PSMC1086, PSMC1087, PSMC1088, PSMC1089, PSMC1090, PSMC1091, PSMC1092, PSMC1093, PSMC1094, PSMC1095, PSMC1096, PSMC1097, PSMC1098, PSMC1099, PSMC1100, PSMC1101, PSMC1102, PSMC1103, PSMC1104, PSMC1105, PSMC1106, PSMC1107, PSMC1108, PSMC1109, PSMC1110, PSMC1111, PSMC1112, PSMC1113, PSMC1114, PSMC1115, PSMC1116, PSMC1117, PSMC1118, PSMC1119, PSMC1120, PSMC1121, PSMC1122, PSMC1123, PSMC1124, PSMC1125, PSMC1126, PSMC1127, PSMC1128, PSMC1129, PSMC1130, PSMC1131, PSMC1132, PSMC1133, PSMC1134, PSMC1135, PSMC1136, PSMC1137, PSMC1138, PSMC1139, PSMC1140, PSMC1141, PSMC1142, PSMC1143, PSMC1144, PSMC1145, PSMC1146, PSMC1147, PSMC1148, PSMC1149, PSMC1150, PSMC1151, PSMC1152, PSMC1153, PSMC1154, PSMC1155, PSMC1156, PSMC1157, PSMC1158, PSMC1159, PSMC1160, PSMC1161, PSMC1162, PSMC1163, PSMC1164, PSMC1165, PSMC1166, PSMC1167, PSMC1168, PSMC1169, PSMC1170, PSMC1171, PSMC1172, PSMC1173, PSMC1174, PSMC1175, PSMC1176, PSMC1177, PSMC1178, PSMC1179, PSMC1180, PSMC1181, PSMC1182, PSMC1183, PSMC1184, PSMC1185, PSMC1186, PSMC1187, PSMC1188, PSMC1189, PSMC1190, PSMC1191, PSMC1192, PSMC1193, PSMC1194, PSMC1195, PSMC1196, PSMC1197, PSMC1198, PSMC1199, PSMC1200, PSMC1201, PSMC1202, PSMC1203, PSMC1204, PSMC1205, PSMC1206, PSMC1207, PSMC1208, PSMC1209, PSMC1210, PSMC1211, PSMC1212, PSMC1213, PSMC1214, PSMC1215, PSMC1216, PSMC1217, PSMC1218, PSMC1219, PSMC1220, PSMC1221, PSMC1222, PSMC1223, PSMC1224, PSMC1225, PSMC1226, PSMC1227, PSMC1228, PSMC1229, PSMC1230, PSMC1231, PSMC1232, PSMC1233, PSMC1234, PSMC1235, PSMC1236, PSMC1237, PSMC1238, PSMC1239, PSMC1240, PSMC1241, PSMC1242, PSMC1243, PSMC1244, PSMC1245, PSMC1246, PSMC1247, PSMC1248, PSMC1249, PSMC1250, PSMC1251, PSMC1252, PSMC1253, PSMC1254, PSMC1255, PSMC1256, PSMC1257, PSMC1258, PSMC1259, PSMC1260, PSMC1261, PSMC1262, PSMC1263, PSMC1264, PSMC1265, PSMC1266, PSMC1267, PSMC1268, PSMC1269, PSMC1270, PSMC1271, PSMC1272, PSMC1273, PSMC1274, PSMC1275, PSMC1276, PSMC1277, PSMC1278, PSMC1279, PSMC1280, PSMC1281, PSMC1282, PSMC1283, PSMC1284, PSMC1285, PSMC1286, PSMC1287, PSMC1288, PSMC1289, PSMC1290, PSMC1291, PSMC1292, PSMC1293, PSMC1294, PSMC1295, PSMC1296, PSMC1297, PSMC1298, PSMC1299, PSMC1300, PSMC1301, PSMC1302, PSMC1303, PSMC1304, PSMC1305, PSMC1306, PSMC1307, PSMC1308, PSMC1309, PSMC1310, PSMC1311, PSMC1312, PSMC1313, PSMC1314, PSMC1315, PSMC1316, PSMC1317, PSMC1318, PSMC1319, PSMC1320, PSMC1321, PSMC1322, PSMC1323, PSMC1324, PSMC1325, PSMC1326, PSMC1327, PSMC1328, PSMC1329, PSMC1330, PSMC1331, PSMC1332, PSMC1333, PSMC1334, PSMC1335, PSMC1336, PSMC1337, PSMC1338, PSMC1339, PSMC1340, PSMC1341, PSMC1342, PSMC1343, PSMC1344, PSMC1345, PSMC1346, PSMC1347, PSMC1348, PSMC1349, PSMC1350, PSMC1351, PSMC1352, PSMC1353, PSMC1354, PSMC1355, PSMC1356, PSMC1357, PSMC1358, PSMC1359, PSMC1360, PSMC1361, PSMC1362, PSMC1363, PSMC1364, PSMC1365, PSMC1366, PSMC1367, PSMC1368, PSMC1369, PSMC1370, PSMC1371, PSMC1372, PSMC1373, PSMC1374, PSMC1375, PSMC1376, PSMC1377, PSMC1378, PSMC1379, PSMC1380, PSMC1381, PSMC1382, PSMC1383, PSMC1384, PSMC1385, PSMC1386, PSMC1387, PSMC1388, PSMC1389, PSMC1390, PSMC13

## Clinical relevance of cell proliferation-related pathways in pancreatic cancer

**Table S2.** Association of other hallmark gene sets scores and patient survival in pancreatic cancer in the TCGA cohort. Cox proportional hazard analyses were used to estimate hazard ratio (HR), 95% CI, and *p*-value. The median value was used as a cut-off to divide low and high groups within cohorts

Category	Pathway	TCGA (OS)				TCGA (DFS)				TCGA (DSS)							
		HR	95% CI		<i>P</i>	HR	95% CI		<i>p</i>	HR	95% CI		<i>P</i>				
Cellular Component	APJ	1.28	0.85	1.94	0.24	1.86	0.79	4.35	0.15	<b>1.68</b>	<b>1.04</b>	<b>2.71</b>	<b>0.03</b>	*			
	APS	<b>1.70</b>	<b>1.11</b>	<b>2.61</b>	<b>0.01</b>	*	2.04	0.85	4.88	0.11	<b>2.04</b>	<b>1.26</b>	<b>3.31</b>	<b>0.00</b>	*		
	PER	1.12	0.74	1.69	0.61	0.94	0.41	2.18	0.89	1.21	0.76	1.93	0.43				
Development	ADI	1.37	0.90	2.08	0.14	1.18	0.51	2.73	0.70	1.48	0.92	2.38	0.10				
	ANG	1.44	0.95	2.18	0.09	<b>2.67</b>	<b>1.11</b>	<b>6.46</b>	<b>0.03</b>	*	<b>1.76</b>	<b>1.10</b>	<b>2.83</b>	<b>0.02</b>	*		
	EMT	1.51	0.99	2.29	0.06	<b>4.34</b>	<b>1.65</b>	<b>11.39</b>	<b>0.00</b>	*	<b>1.73</b>	<b>1.08</b>	<b>2.78</b>	<b>0.02</b>	*		
	MYO	0.88	0.58	1.34	0.56	1.07	0.47	2.46	0.87	1.13	0.71	1.79	0.62				
	PAN	0.83	0.55	1.26	0.38	<b>0.40</b>	<b>0.17</b>	<b>0.95</b>	<b>0.04</b>	*	0.98	0.62	1.56	0.94			
	SPE	0.93	0.62	1.41	0.74	0.67	0.29	1.52	0.34	1.01	0.64	1.62	0.95				
	DNA damage	DNA	1.37	0.90	2.08	0.14	0.60	0.26	1.38	0.23	1.37	0.86	2.19	0.19			
	UVD	1.43	0.94	2.16	0.09	2.46	1.03	5.91	0.04	1.49	0.94	2.39	0.09				
	UVU	<b>1.53</b>	<b>1.00</b>	<b>2.32</b>	<b>0.05</b>	*	1.13	0.49	2.62	0.77	<b>1.69</b>	<b>1.05</b>	<b>2.73</b>	<b>0.03</b>	*		
Immune	ALL	1.21	0.80	1.83	0.37	1.16	0.49	2.76	0.73	1.27	0.80	2.02	0.31				
	COA	1.47	0.97	2.24	0.07	1.27	0.55	2.90	0.58	<b>1.87</b>	<b>1.15</b>	<b>3.02</b>	<b>0.01</b>	*			
	COM	<b>1.82</b>	<b>1.20</b>	<b>2.77</b>	<b>0.01</b>	*	1.40	0.59	3.34	0.45	<b>1.97</b>	<b>1.22</b>	<b>3.17</b>	<b>0.01</b>	*		
	IFA	<b>1.68</b>	<b>1.11</b>	<b>2.55</b>	<b>0.01</b>	*	1.34	0.58	3.09	0.49	<b>1.60</b>	<b>1.00</b>	<b>2.56</b>	<b>0.05</b>	*		
	IFG	1.31	0.86	1.98	0.21	0.95	0.41	2.22	0.91	1.26	0.79	2.01	0.32				
	IL6	1.40	0.92	2.12	0.12	1.35	0.56	3.23	0.51	1.57	0.98	2.52	0.06				
	INF	1.44	0.95	2.19	0.09	1.12	0.47	2.67	0.79	<b>1.74</b>	<b>1.08</b>	<b>2.80</b>	<b>0.02</b>	*			
Metabolic	BIL	0.86	0.57	1.30	0.46	0.82	0.36	1.91	0.65	0.87	0.54	1.38	0.55				
	CHO	1.68	1.10	2.56	0.02	*	1.17	0.52	2.66	0.71	<b>1.62</b>	<b>1.01</b>	<b>2.60</b>	<b>0.04</b>	*		
	FAT	1.39	0.92	2.12	0.12	0.89	0.39	2.03	0.78	1.37	0.86	2.19	0.19				
	GLY	1.76	1.15	2.69	0.01	*	1.90	0.82	4.40	0.13	<b>2.08</b>	<b>1.27</b>	<b>3.39</b>	<b>0.00</b>	*		
	HEM	1.29	0.85	1.95	0.23	0.72	0.32	1.64	0.43	1.40	0.88	2.25	0.16				
	OXI	0.95	0.63	1.44	0.81	0.73	0.31	1.72	0.47	0.87	0.54	1.38	0.54				
	XEN	1.67	1.10	2.54	0.02	*	1.35	0.59	3.08	0.48	<b>1.72</b>	<b>1.07</b>	<b>2.75</b>	<b>0.02</b>	*		
Pathway	APO	1.88	1.22	2.88	0.00	*	2.18	0.92	5.19	0.08	<b>2.17</b>	<b>1.33</b>	<b>3.53</b>	<b>0.00</b>	*		
	HYP	1.93	1.26	2.97	0.00	*	2.23	0.97	5.10	0.06	<b>2.22</b>	<b>1.36</b>	<b>3.63</b>	<b>0.00</b>	*		
	PRO	1.49	0.98	2.27	0.06	1.15	0.50	2.66	0.75	1.56	0.97	2.51	0.07				
	REA	1.10	0.73	1.66	0.66	0.78	0.34	1.77	0.55	1.05	0.66	1.67	0.83				
	UNF	1.14	0.75	1.74	0.53	0.74	0.32	1.70	0.48	1.17	0.73	1.88	0.52				
	Signaling	AND	<b>1.86</b>	<b>1.22</b>	<b>2.84</b>	<b>0.00</b>	*	<b>2.43</b>	<b>1.02</b>	<b>5.83</b>	<b>0.05</b>	*	<b>1.97</b>	<b>1.22</b>	<b>3.18</b>	<b>0.01</b>	*
		ERE	<b>1.95</b>	<b>1.28</b>	<b>2.99</b>	<b>0.00</b>	*	2.15	0.93	4.94	0.07	<b>2.18</b>	<b>1.34</b>	<b>3.55</b>	<b>0.00</b>	*	
	ERL	<b>2.22</b>	<b>1.45</b>	<b>3.41</b>	<b>0.00</b>	*	1.09	0.48	2.49	0.84	<b>2.43</b>	<b>1.49</b>	<b>3.96</b>	<b>0.00</b>	*		
	HED	0.79	0.52	1.20	0.27	1.25	0.54	2.91	0.60	1.00	0.63	1.60	0.99				
	IL2	1.35	0.89	2.04	0.16	1.49	0.62	3.55	0.37	1.44	0.90	2.30	0.12				
	KRD	0.98	0.65	1.49	0.94	1.51	0.65	3.50	0.34	1.07	0.67	1.70	0.78				
	KRU	1.47	0.97	2.23	0.07	1.85	0.76	4.49	0.17	<b>1.70</b>	<b>1.06</b>	<b>2.73</b>	<b>0.03</b>	*			
	MTO	<b>1.56</b>	<b>1.02</b>	<b>2.38</b>	<b>0.04</b>	*	1.79	0.76	4.23	0.18	<b>1.70</b>	<b>1.05</b>	<b>2.76</b>	<b>0.03</b>	*		
	NOT	1.51	1.00	2.29	0.05	2.25	0.97	5.23	0.06	<b>1.79</b>	<b>1.11</b>	<b>2.89</b>	<b>0.02</b>	*			
	PI3	<b>1.56</b>	<b>1.02</b>	<b>2.37</b>	<b>0.04</b>	*	1.16	0.51	2.64	0.73	<b>1.68</b>	<b>1.04</b>	<b>2.70</b>	<b>0.03</b>	*		
	TGF	<b>1.67</b>	<b>1.10</b>	<b>2.54</b>	<b>0.02</b>	*	<b>3.21</b>	<b>1.32</b>	<b>7.85</b>	<b>0.01</b>	*	<b>2.15</b>	<b>1.31</b>	<b>3.51</b>	<b>0.00</b>	*	
	TNF	<b>1.56</b>	<b>1.03</b>	<b>2.37</b>	<b>0.04</b>	*	2.01	0.86	4.69	0.11	<b>1.85</b>	<b>1.15</b>	<b>2.97</b>	<b>0.01</b>	*		
	WNT	1.29	0.85	1.95	0.23	1.87	0.80	4.34	0.15	1.43	0.90	2.29	0.13				

ADI, Adipogenesis; ALL, Allograft rejection; AND, Androgen response; ANG, Angiogenesis; APO, Apoptosis; APS, Apical surface; APJ, Apical junction; BIL, Bile acid metabolism; CHO, Cholesterol homeostasis; COA, Coagulation; COM, Complement; DNA, DNA repair; EMT, Epithelial mesenchymal transition; ERE, Estrogen response early; ERL, Estrogen response late; FAT, Fatty acid metabolism; GLY, Glycolysis; HED, Hedgehog signaling; HEM, Heme metabolism; HYP, Hypoxia; IFA, Interferon alpha response; IFG, Interferon gamma response; IL2, IL2/JAK/STAT5 signaling; IL6, IL6/JAK/STAT3 signaling; INF, Inflammatory response; KRD, KRAS signaling down; KRU, KRAS signaling up; MTO, Mtorc1 signaling; MYO, Myogenesis; NOT, Notch signaling; OXI, Oxidative phosphorylation; PAN, Pancreas beta cell; PER, Peroxisome; PI3, PI3K/AKT/MTOR signaling; PRO, Protein secretion; REA, Reactive oxygen species pathway; SPE, Spermatogenesis; TGF, TGF beta signaling; TNF, TNFa signaling via NFkB; UNF, Unfolded protein response; UVD, UV response down; UVU, UV response up; XEN, Xenobiotic metabolism; WNT, WNT beta catenin signaling.

## Clinical relevance of cell proliferation-related pathways in pancreatic cancer

**Table S3.** Association of other hallmark gene sets scores and patient survival in pancreatic cancer in the GSE57495 and GSE62452 cohorts. Cox proportional hazard analyses were used to estimate hazard ratio (HR), 95% CI, and *p*-value. The median value was used as a cut-off to divide low and high groups within cohorts

Category	Pathway	GSE57495 (OS)				GSE62452 (OS)					
		HR	95% CI		<i>P</i>	HR	95% CI		<i>P</i>		
Cellular Component	APJ	<b>2.44</b>	<b>1.29</b>	<b>4.61</b>	<b>0.01</b>	*	1.14	0.65	2.00	0.64	
	APS	1.39	0.75	2.58	0.29		1.61	0.91	2.84	0.10	
	PER	1.12	0.61	2.05	0.72		0.98	0.55	1.74	0.94	
Development	ADI	0.99	0.54	1.82	0.98		1.03	0.58	1.81	0.92	
	ANG	0.90	0.49	1.65	0.74		0.86	0.49	1.51	0.60	
	EMT	1.25	0.68	2.29	0.48		1.04	0.59	1.83	0.89	
	MYO	0.59	0.32	1.10	0.10		0.96	0.54	1.70	0.88	
	PAN	0.76	0.41	1.39	0.37		0.61	0.35	1.08	0.09	
DNA damage	SPE	1.14	0.62	2.10	0.66		1.06	0.60	1.86	0.85	
	DNA	0.72	0.39	1.32	0.29		1.49	0.84	2.64	0.17	
	UVD	1.44	0.78	2.66	0.24		1.07	0.61	1.90	0.81	
Immune	UVU	0.96	0.52	1.76	0.89		1.05	0.60	1.84	0.87	
	ALL	0.94	0.52	1.73	0.85		1.16	0.65	2.04	0.62	
	COA	1.06	0.58	1.94	0.85		0.77	0.44	1.37	0.37	
Metabolic	COM	0.98	0.53	1.79	0.94		1.07	0.61	1.88	0.82	
	IFA	1.39	0.75	2.56	0.30		<b>1.94</b>	<b>1.05</b>	<b>3.58</b>	<b>0.03</b>	*
	IFG	0.82	0.45	1.51	0.53		1.23	0.69	2.18	0.48	
	IL6	0.87	0.47	1.59	0.64		1.21	0.68	2.14	0.52	
	INF	0.98	0.54	1.80	0.95		1.15	0.65	2.04	0.62	
	BIL	0.77	0.42	1.42	0.40		<b>0.45</b>	<b>0.25</b>	<b>0.80</b>	<b>0.01</b>	*
	CHO	1.53	0.83	2.84	0.18		0.99	0.56	1.73	0.96	
Pathway	FAT	1.39	0.76	2.55	0.29		0.83	0.47	1.46	0.53	
	GLY	1.72	0.93	3.20	0.08		<b>1.88</b>	<b>1.05</b>	<b>3.34</b>	<b>0.03</b>	*
	HEM	1.09	0.59	1.99	0.79		1.41	0.80	2.48	0.24	
	OXI	1.01	0.55	1.86	0.96		0.98	0.54	1.75	0.94	
	XEN	0.94	0.51	1.73	0.85		0.85	0.48	1.49	0.57	
	APO	<b>2.41</b>	<b>1.29</b>	<b>4.50</b>	<b>0.01</b>	*	1.03	0.59	1.82	0.92	
	HYP	1.43	0.77	2.62	0.26		1.42	0.81	2.49	0.22	
Signaling	PRO	1.87	1.00	3.48	0.05		1.28	0.72	2.25	0.40	
	REA	1.25	0.68	2.29	0.47		1.01	0.58	1.79	0.96	
	UNF	0.97	0.53	1.78	0.92		<b>1.91</b>	<b>1.07</b>	<b>3.42</b>	<b>0.03</b>	*
	AND	1.54	0.83	2.85	0.17		1.28	0.72	2.28	0.40	
	ERE	1.01	0.55	1.85	0.98		1.05	0.59	1.84	0.88	
	ERL	1.13	0.62	2.08	0.69		0.95	0.54	1.68	0.87	
	HED	1.20	0.65	2.21	0.56		0.63	0.36	1.10	0.11	
	IL2	0.85	0.47	1.57	0.61		1.00	0.57	1.77	0.99	
	KRD	0.67	0.36	1.23	0.19		0.74	0.42	1.29	0.28	
	KRU	0.88	0.48	1.62	0.69		0.98	0.56	1.73	0.95	
MTO	<b>2.01</b>	<b>1.08</b>	<b>3.76</b>	<b>0.03</b>	*	<b>1.94</b>	<b>1.08</b>	<b>3.51</b>	<b>0.03</b>	*	
NOT	1.05	0.57	1.92	0.89		0.90	0.51	1.59	0.72		
PI3	1.63	0.88	3.00	0.12		1.55	0.88	2.75	0.13		
TGF	1.26	0.69	2.31	0.45		0.86	0.49	1.51	0.60		
TNF	0.89	0.48	1.63	0.70		0.84	0.48	1.47	0.54		
WNT	0.93	0.50	1.70	0.80		1.05	0.60	1.85	0.86		

ADI, Adipogenesis; ALL, Allograft rejection; AND, Androgen response; ANG, Angiogenesis; APO, Apoptosis; APS, Apical surface; APJ, Apical junction; BIL, Bile acid metabolism; CHO, Cholesterol homeostasis; COA, Coagulation; COM, Complement; DNA, DNA repair; EMT, Epithelial mesenchymal transition; ERE, Estrogen response early; ERL, Estrogen response late; FAT, Fatty acid metabolism; GLY, Glycolysis; HED, Hedgehog signaling; HEM, Heme metabolism; HYP, Hypoxia; IFA, Interferon alpha response; IFG, Interferon gamma response; IL2, IL2/JAK/STAT5 signaling; IL6, IL6/JAK/STAT3 signaling; INF, Inflammatory response; KRD, KRAS signaling down; KRU, KRAS signaling up; MTO, Mtorc1 signaling; MYO, Myogenesis; NOT, Notch signaling; OXI, Oxidative phosphorylation; PAN, Pancreas beta cell; PER, Peroxisome; PI3, PI3K/AKT/MTOR signaling; PRO, Protein secretion; REA, Reactive oxygen species pathway; SPE, Spermatogenesis; TGF, TGF beta signaling; TNF, TNFa signaling via NFkB; UNF, Unfolded protein response; UVD, UV response down; UVU, UV response up; XEN, Xenobiotic metabolism; WNT, WNT beta catenin signaling.