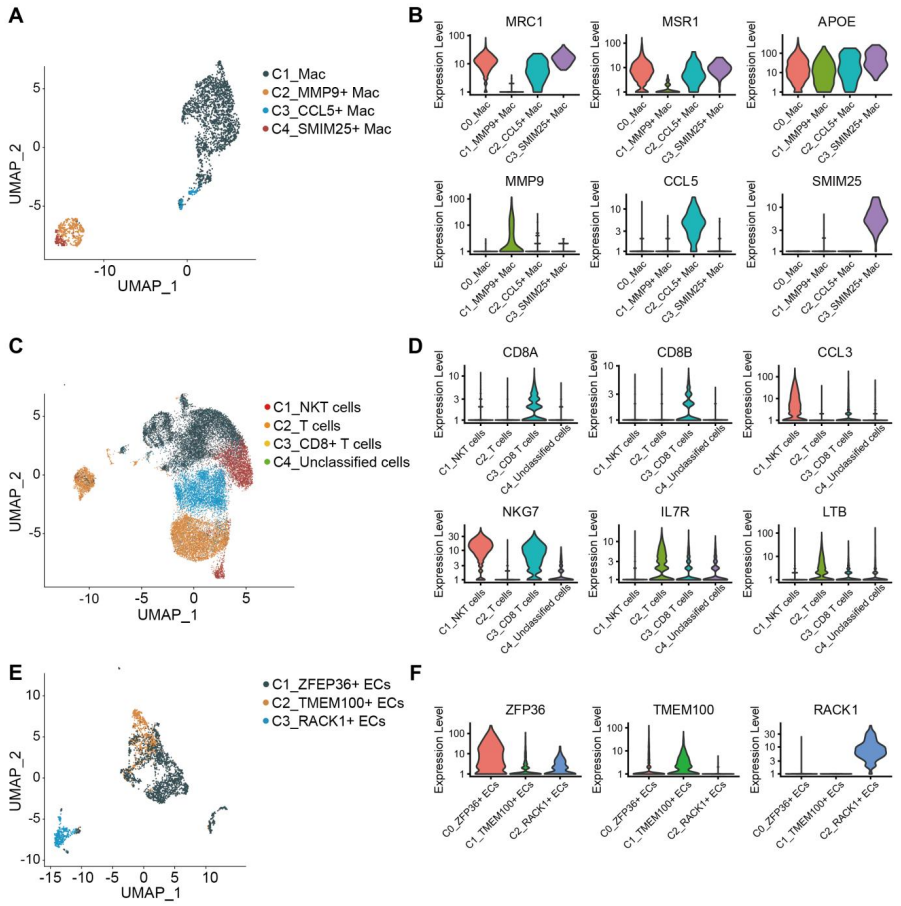

Figure S1 Subclusters of macrophages, T cells, and endothelial cells subdivided according to their specific markers, respectively. (A) UMAP plot shows four main subtypes of macrophages: C1_Mac, C2_MMP9^{+} Mac, C3_CCL5^{+} Mac, and C4_SMIM25^{+} Mac. (B) Violin plots showing relevant marker genes in each macrophages subtypes. (C) UMAP plot shows main subtypes of T cells: C1_NKT cells, C2_T cells, and C3_CD8^{+} T cells. (D) Violin plots showing relevant marker genes in each T subtypes. (E) UMAP plot shows four main subtypes of endothelial cells: C1_ZFEP36^{+} ECs, C1_TMEM^{+} ECs, and C1_RACK1^{+} ECs. (F) Violin plots showing relevant marker genes in each subtypes of endothelial cells.

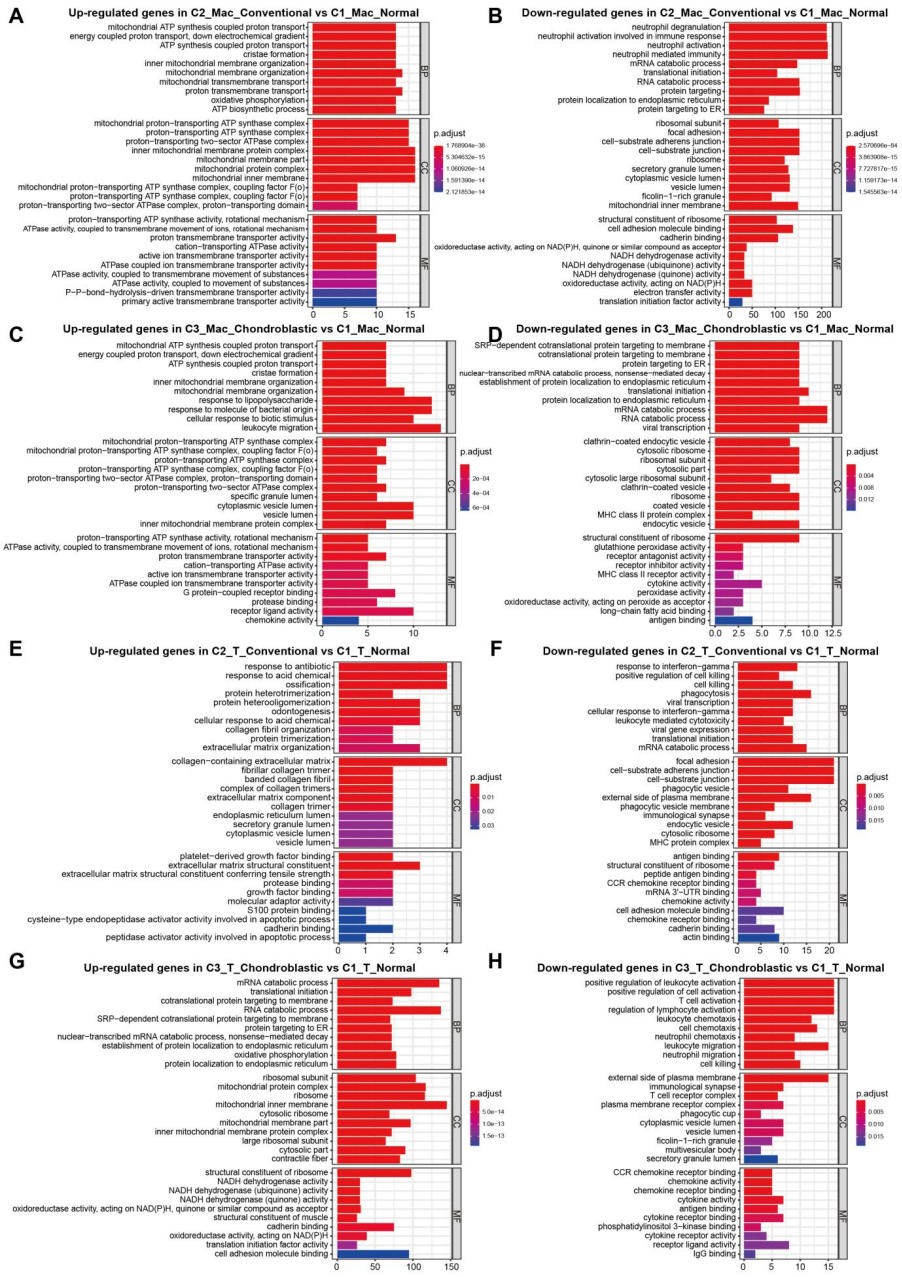

Figure S2 GO analysis of macrophages and T cells, respectively. (A-B) Bar chart showing the GO analyses of upregulated (left) and downregulated (right) DEGs in C2_Mac_Conventional vs. C1_Mac_Normal. (C-D) Bar chart showing the GO analyses of upregulated (left) and downregulated (right) DEGs of C3_Mac_Chondroblastic vs. C1_Mac_Normal. (E-F) Bar chart showing the GO analyses of upregulated (left) and downregulated (right) DEGs of C2_T_Conventional vs. C1_T_Normal. (G-H) Bar chart showing the GO analyses of upregulated (left) and downregulated (right) DEGs of C3_T_Chondroblastic vs. C1_T_Normal.

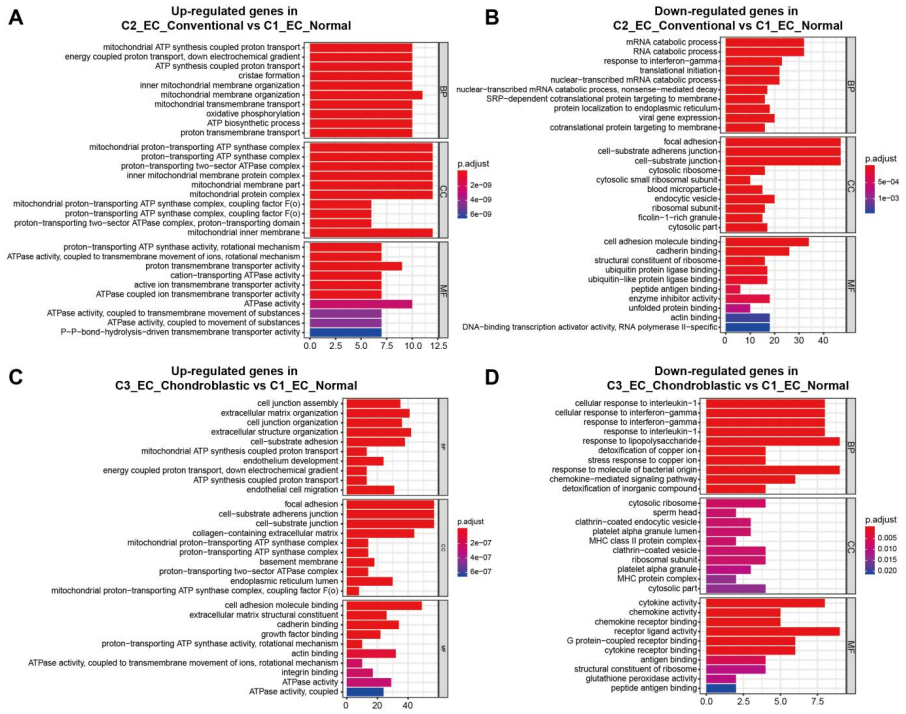

Figure S3 GO analysis of endothelial cells. (A-B) Bar chart showing the GO analyses of upregulated (left) and downregulated (right) DEGs in C2_EC_Conventional vs. C1_EC_Normal. (C-D) Bar chart showing the GO analyses of upregulated (left) and downregulated (right) DEGs of C3_EC_Chondroblastic vs. C1_EC_Normal.

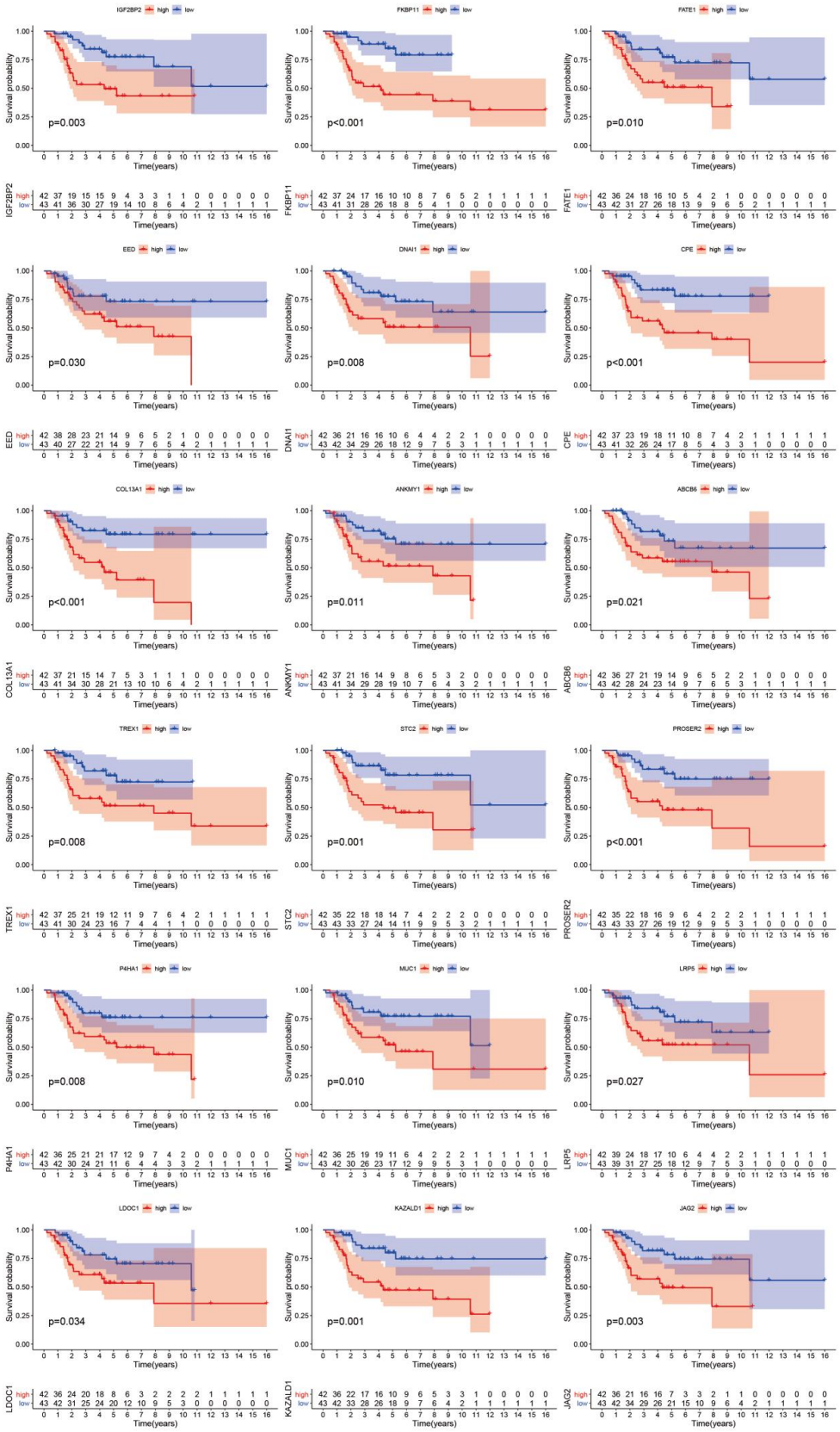

Figure S4 18 genes with poor prognosis obtained by survival analysis combined with TARGET-OS dataset.

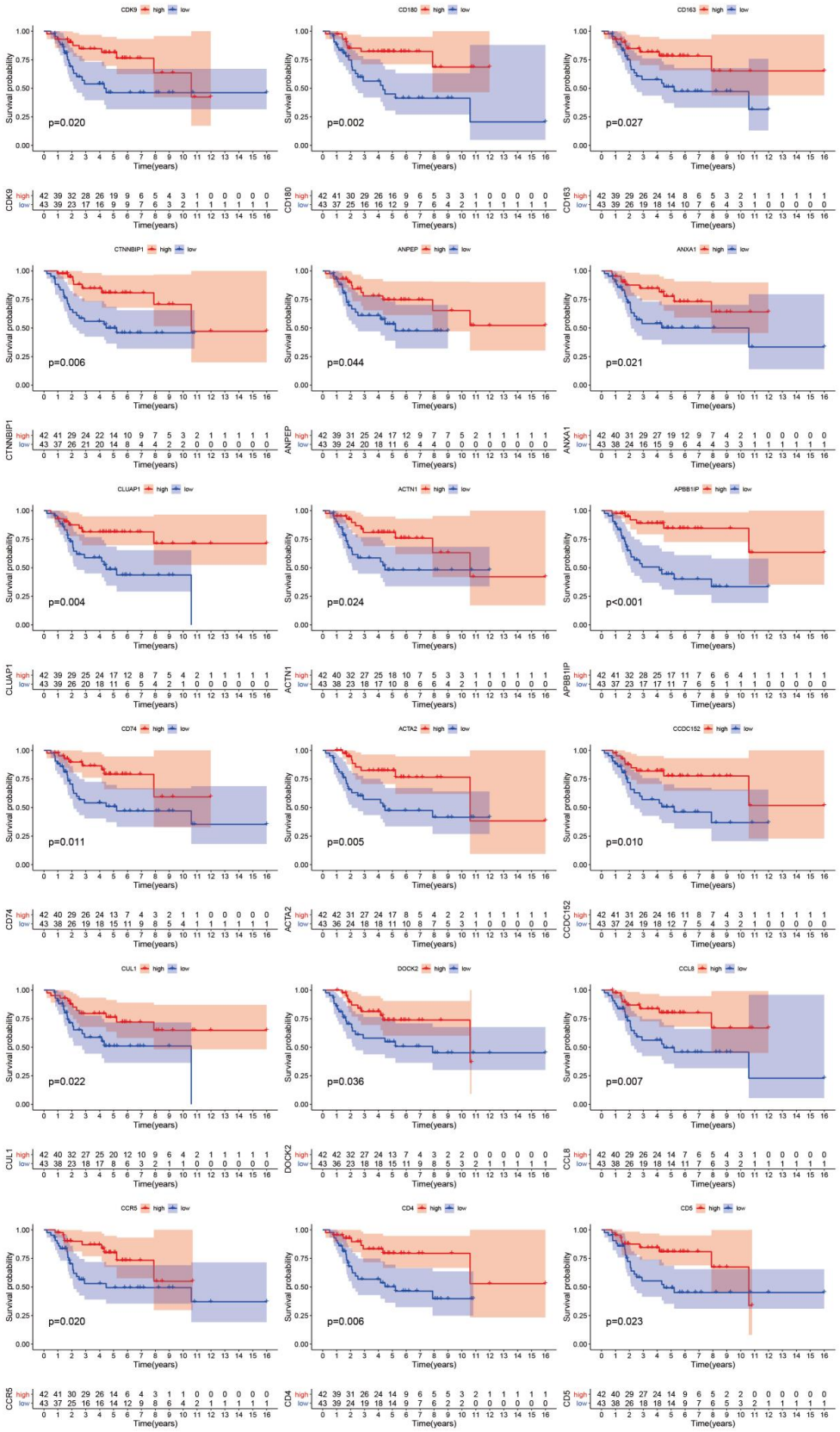

Figure S5_1 The first eighteen of 49 genes with good prognosis obtained by survival analysis combined with TARGET-OS dataset.

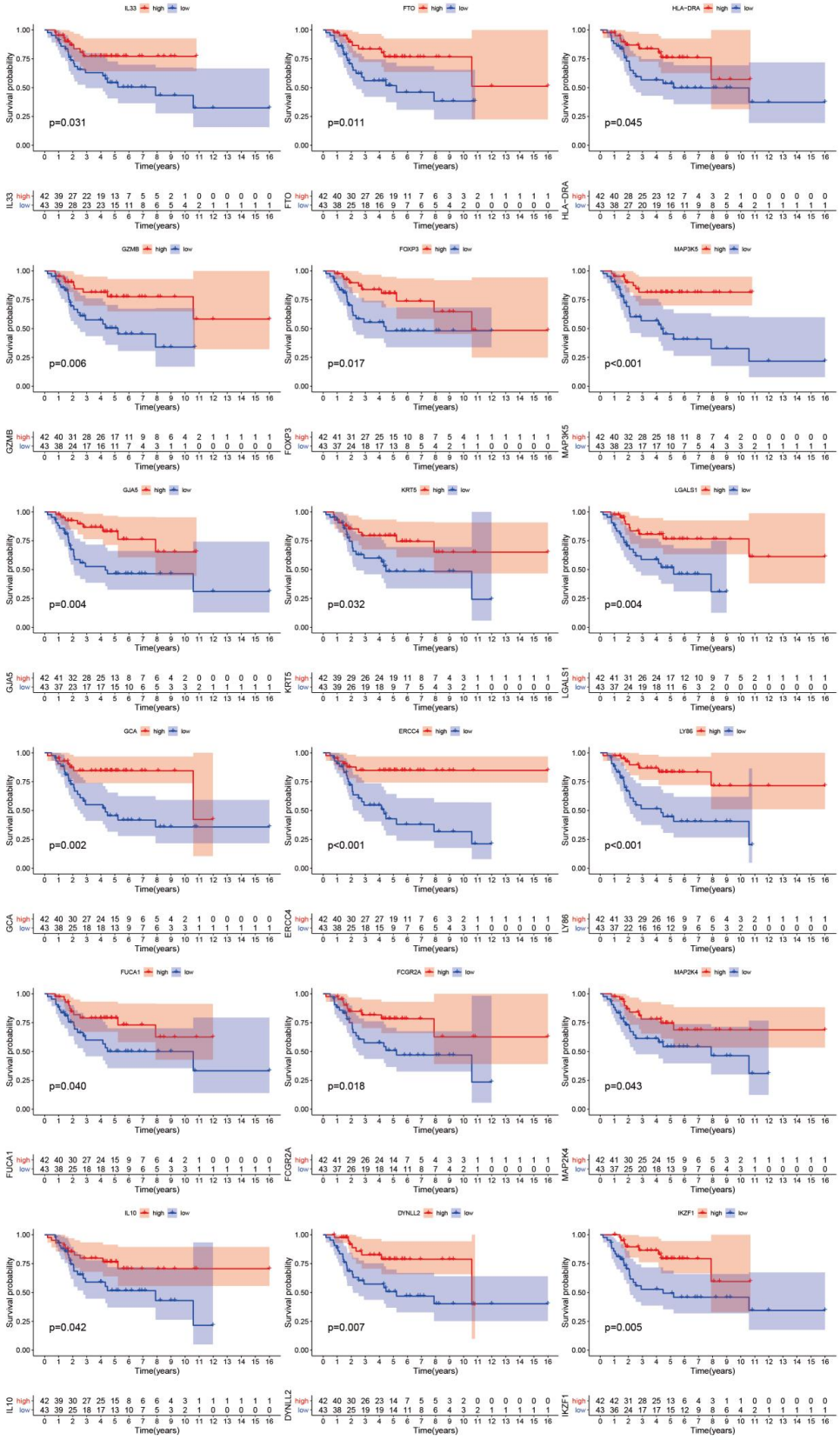

Figure S5_2 The second eighteen of 49 genes with good prognosis obtained by survival analysis combined with TARGET-OS dataset.

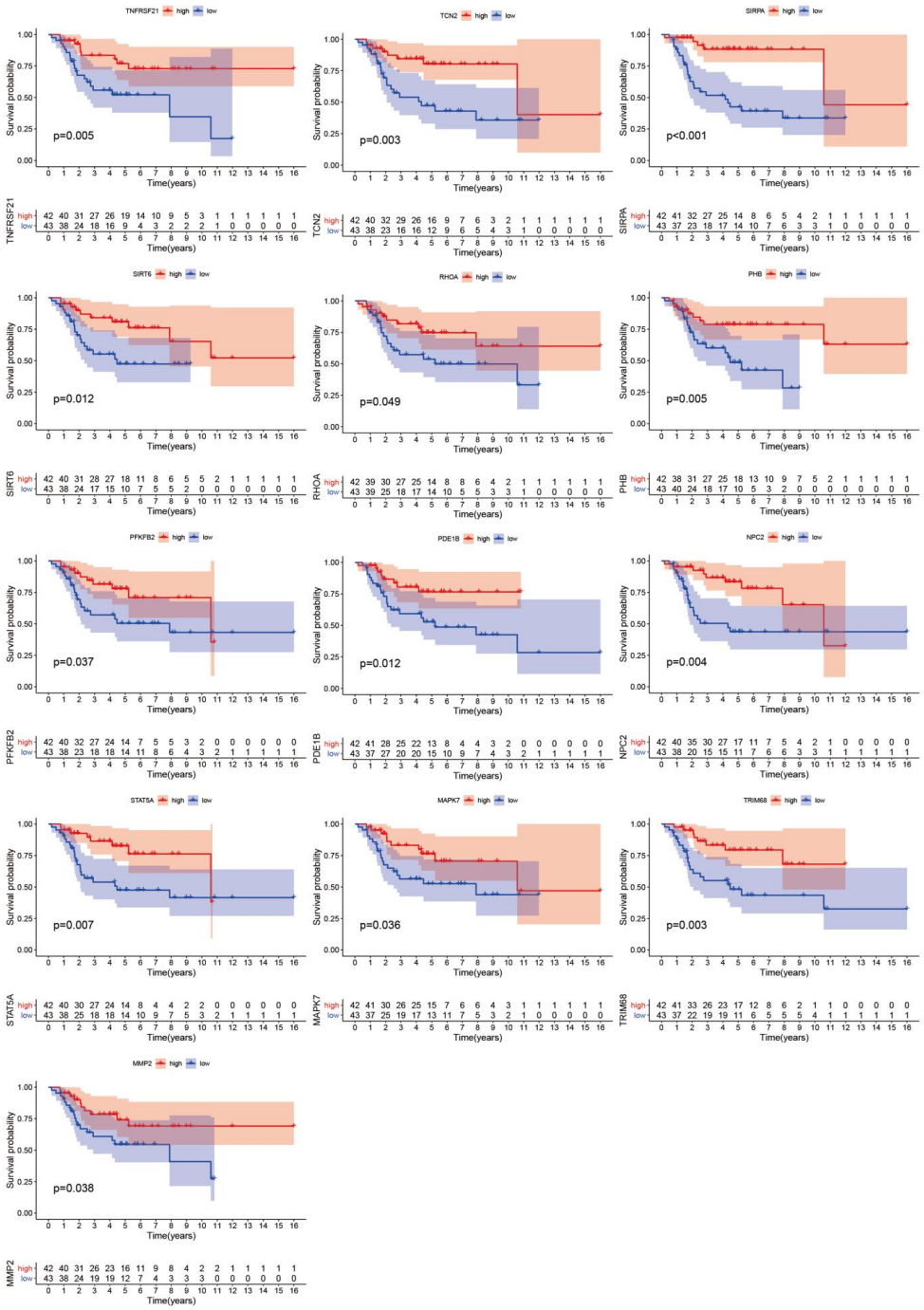

Figure S5_3 The last thirteen of 49 genes with good prognosis obtained by survival analysis combined with TARGET-OS dataset.

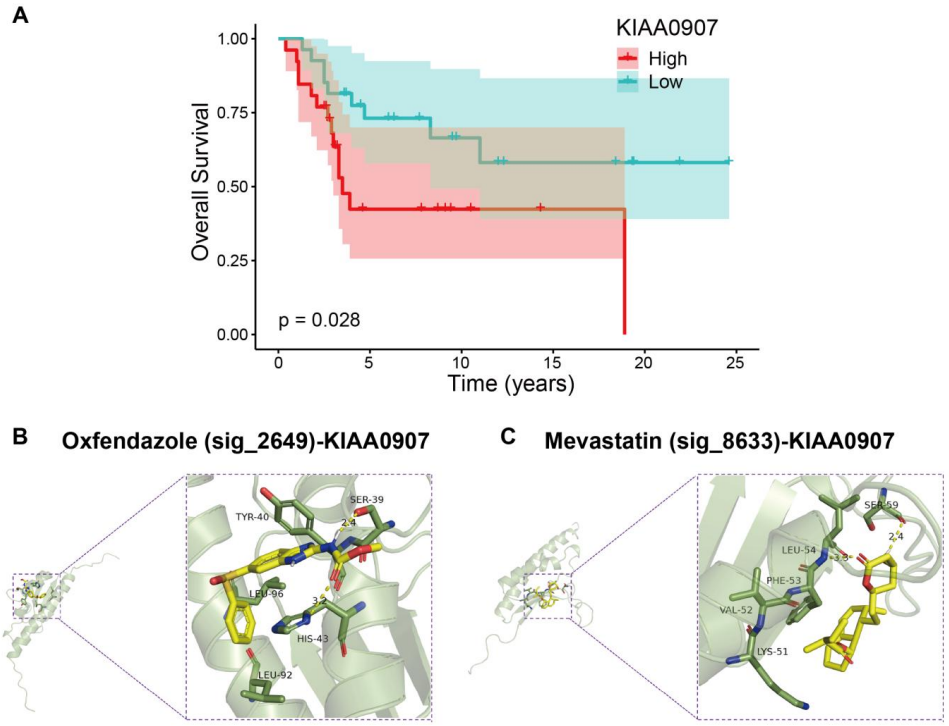

Figure S6 Interaction diagram of drugs with their respective therapeutic targets identified using the Beyondcell analysis. (A) Kaplan-Meier survival curve of KIAA0907. Predicted binding conformations of (B) oxfendazole (sig_2649)-KIAA0907, and (C) mevastatin (sig_8633)-KIAA0907 visualized via PyMol.

Supplementary table 1 The canonical markers of cell types.

Gene	Marker of	Reference
CD3D	C1_T cells	1, 2
CD3E	C1_T cells	1, 2
CD3G	C1_T cells	2
SOX9	C2_Malignant cells	3
ALPL	C2_Malignant cells	4
RUNX2	C2_Malignant cells	4
CD14	C3_Monocytes	5
VCAN	C3_Monocytes	2
FCN1	C3_Monocytes	2
SFTPC	C4_Alveolar cells	6
SLPI	C4_Alveolar cells	7
CD163	C5_Osteoclasts	8
ACP5	C5_Osteoclasts	4, 8
ATP6V0D2	C5_Osteoclasts	9
CTSK	C5_Osteoclasts	4, 8
PECAM1	C6_Endothelial cells	3, 10
EGFL7	C6_Endothelial cells	11
PLVAP	C6_Endothelial cells	12
KIT	C7_Mast cells	13
HPGDS	C7_Mast cells	14
TPSB2	C7_Mast cells	15
MKI67	C8_Proliferative cells	3, 15
CDK1	C8_Proliferative cells	2, 15, 16
TOP2A	C8_Proliferative cells	3
CD163	C9_Macrophages	3
MRC1	C9_Macrophages	3
MSR1	C9_Macrophages	17, 18
APOE	C9_Macrophages	19
CD5L	C9_Macrophages	20
VCAN	C10_Fibroblasts	15
PDGFRA	C10_Fibroblasts	10
FAP	C10_Fibroblasts	21
CLEC9A	C11_Dendritic cells	15
XCR1	C11_Dendritic cells	15
CD1C	C11_Dendritic cells	15
CLEC10A	C11_Dendritic cells	15
CD19	C12_B cells	10, 19
CD79A	C12_B cells	19
MS4A1	C12_B cells	19
ACTA2	C13_Muscle cells	15
TAGLN	C13_Muscle cells	15

MUC5AC	C14_Secretory cells	[22, 23]
MUC5B	C14_Secretory cells	[23]
SCGB1A1	C14_Secretory cells	[24]
EPCAM	C15_Ciliated cells	[15]
PIFO	C15_Ciliated cells	[15]
FOXJ1	C15_Ciliated cells	[15]
XBP1	C17_Plasma cells	[15]
JCHAIN	C17_Plasma cells	[15]

References

1. Zhang S, Liu Z, Wu D, Chen L, Xie L. Single-Cell RNA-Seq Analysis Reveals Microenvironmental Infiltration of Plasma Cells and Hepatocytic Prognostic Markers in HCC With Cirrhosis. *Front Oncol* 2020;**10**:596318

2. Kim N, Kim HK, Lee K, Hong Y, Cho JH, Choi JW, Lee JI, Suh YL, Ku BM, Eum HH, Choi S, Choi YL, Joung JG, Park WY, Jung HA, Sun JM, Lee SH, Ahn JS, Park K, Ahn MJ, Lee HO. Single-cell RNA sequencing demonstrates the molecular and cellular reprogramming of metastatic lung adenocarcinoma. *Nat Commun* 2020;**11**:2285

3. Zhou Y, Yang D, Yang Q, Lv X, Huang W, Zhou Z, Wang Y, Zhang Z, Yuan T, Ding X, Tang L, Zhang J, Yin J, Huang Y, Yu W, Wang Y, Zhou C, Su Y, He A, Sun Y, Shen Z, Qian B, Meng W, Fei J, Yao Y, Pan X, Chen P, Hu H. Single-cell RNA landscape of intratumoral heterogeneity and immunosuppressive microenvironment in advanced osteosarcoma. *Nat Commun* 2020;**11**:6322

4. Nordstrand A, Bovinder Ylitalo E, Thysell E, Jernberg E, Crnalic S, Widmark A, Bergh A, Lerner UH, Wikström P. Bone Cell Activity in Clinical Prostate Cancer Bone Metastasis and Its Inverse Relation to Tumor Cell Androgen Receptor Activity. *Int J Mol Sci* 2018;**19**

5. Hamers AAJ, Dinh HQ, Thomas GD, Marcovecchio P, Blatchley A, Nakao CS, Kim C, McSkimming C, Taylor AM, Nguyen AT, McNamara CA, Hedrick CC. Human Monocyte Heterogeneity as Revealed by High-Dimensional Mass Cytometry. *Arteriosclerosis, thrombosis, and*

vascular biology 2019;**39**:25-36

6. Lambrechts D, Wauters E, Boeckx B, Aibar S, Nittner D, Burton O, Bassez A, Decaluwé H, Pircher A, Van den Eynde K, Weynand B, Verbeken E, De Leyn P, Liston A, Vansteenkiste J, Carmeliet P, Aerts S, Thienpont B. Phenotype molding of stromal cells in the lung tumor microenvironment. *Nature medicine* 2018;**24**:1277-89

7. Nishimura J, Saiga H, Sato S, Okuyama M, Kayama H, Kuwata H, Matsumoto S, Nishida T, Sawa Y, Akira S, Yoshikai Y, Yamamoto M, Takeda K. Potent antimycobacterial activity of mouse secretory leukocyte protease inhibitor. *J Immunol* 2008;**180**:4032-9

8. Zenger S, Ek-Rylander B, Andersson G. Long bone osteoclasts display an augmented osteoclast phenotype compared to calvarial osteoclasts. *Biochemical and biophysical research communications* 2010;**394**:743-9

9. Lee SH, Rho J, Jeong D, Sul JY, Kim T, Kim N, Kang JS, Miyamoto T, Suda T, Lee SK, Pignolo RJ, Koczon-Jaremko B, Lorenzo J, Choi Y. v-ATPase V0 subunit d2-deficient mice exhibit impaired osteoclast fusion and increased bone formation. *Nature medicine* 2006;**12**:1403-9

10. Xu Z, You W, Chen W, Zhou Y, Nong Q, Valencak TG, Wang Y, Shan T. Single-cell RNA sequencing and lipidomics reveal cell and lipid dynamics of fat infiltration in skeletal muscle. *Journal of cachexia, sarcopenia and muscle* 2021;**12**:109-29

11. Chim SM, Kuek V, Chow ST, Lim BS, Tickner J, Zhao J, Chung R, Su YW, Zhang G, Erber W, Xian CJ, Rosen V, Xu J. EGFL7 is expressed in bone microenvironment and promotes angiogenesis via ERK, STAT3, and integrin signaling cascades. *Journal of cellular physiology* 2015;**230**:82-94

12. Auvinen K, Lokka E, Mokkala E, Jäppinen N, Tyystjärvi S, Saine H, Peurla M, Shetty S, Elima K, Rantakari P, Salmi M. Fenestral diaphragms and PLVAP associations in liver sinusoidal endothelial

cells are developmentally regulated. *Scientific reports* 2019;**9**:15698

13. Murata A, Hikosaka M, Yoshino M, Zhou L, Hayashi SI. Kit-independent mast cell adhesion mediated by Notch. *International immunology* 2019;**31**:69-79

14. Mohri I, Eguchi N, Suzuki K, Urade Y, Taniike M. Hematopoietic prostaglandin D synthase is expressed in microglia in the developing postnatal mouse brain. *Glia* 2003;**42**:263-74

15. Madissoon E, Wilbrey-Clark A, Miragaia RJ, Saeb-Parsy K, Mahbubani KT, Georgakopoulos N, Harding P, Polanski K, Huang N, Nowicki-Osuch K, Fitzgerald RC, Loudon KW, Ferdinand JR, Clatworthy MR, Tsingene A, van Dongen S, Dabrowska M, Patel M, Stubbington MJT, Teichmann SA, Stegle O, Meyer KB. scRNA-seq assessment of the human lung, spleen, and esophagus tissue stability after cold preservation. *Genome biology* 2019;**21**:1

16. Haneke K, Schott J, Lindner D, Hollensen AK, Damgaard CK, Mongis C, Knop M, Palm W, Ruggieri A, Stoecklin G. CDK1 couples proliferation with protein synthesis. *The Journal of cell biology* 2020;**219**

17. Allavena P, Mantovani A. Immunology in the clinic review series; focus on cancer: tumour-associated macrophages: undisputed stars of the inflammatory tumour microenvironment. *Clin Exp Immunol* 2012;**167**:195-205

18. Sica A, Rubino L, Mancino A, Larghi P, Porta C, Rimoldi M, Solinas G, Locati M, Allavena P, Mantovani A. Targeting tumour-associated macrophages. *Expert opinion on therapeutic targets* 2007;**11**:1219-29

19. Chen YP, Yin JH, Li WF, Li HJ, Chen DP, Zhang CJ, Lv JW, Wang YQ, Li XM, Li JY, Zhang PP, Li YQ, He QM, Yang XJ, Lei Y, Tang LL, Zhou GQ, Mao YP, Wei C, Xiong KX, Zhang HB, Zhu SD, Hou Y, Sun Y, Dean M, Amit I, Wu K, Kuang DM, Li GB, Liu N, Ma J. Single-cell transcriptomics

reveals regulators underlying immune cell diversity and immune subtypes associated with prognosis in nasopharyngeal carcinoma. *Cell Res* 2020;**30**:1024-42

20. Sanchez-Moral L, Ràfols N, Martori C, Paul T, Téllez É, Sarrias MR. Multifaceted Roles of CD5L in Infectious and Sterile Inflammation. *Int J Mol Sci* 2021;**22**

21. Nurmik M, Ullmann P, Rodriguez F, Haan S, Letellier E. In search of definitions: Cancer-associated fibroblasts and their markers. *International journal of cancer* 2020;**146**:895-905

22. Lakshmanan I, Rachagani S, Hauke R, Krishn SR, Paknikar S, Seshacharyulu P, Karmakar S, Nimmakayala RK, Kaushik G, Johansson SL, Carey GB, Ponnusamy MP, Kaur S, Batra SK, Ganti AK. MUC5AC interactions with integrin β4 enhances the migration of lung cancer cells through FAK signaling. *Oncogene* 2016;**35**:4112-21

23. Okuda K, Chen G, Subramani DB, Wolf M, Gilmore RC, Kato T, Radicioni G, Kesimer M, Chua M, Dang H, Livraghi-Butrico A, Ehre C, Doerschuk CM, Randell SH, Matsui H, Nagase T, O'Neal WK, Boucher RC. Localization of Secretory Mucins MUC5AC and MUC5B in Normal/Healthy Human Airways. *American journal of respiratory and critical care medicine* 2019;**199**:715-27

24. Côté O, Lillie BN, Hayes MA, Clark ME, van den Bosch L, Katavolos P, Viel L, Bienzle D. Multiple secretoglobin 1A1 genes are differentially expressed in horses. *BMC genomics* 2012;**13**:712

Supplementary table 2 Genes previously reported to be associated with survival of osteosarcoma.

Genes	References
ABCB1	1-4
ABCB6	5
ABCC3	1, 3
ABCC5	6
ABCG2	7, 8
AEG-1	9
AKT1	10
ALDOA	11
ALOX5AP	12
Angptl2	13
ANKMY1	14
ANPEP	15
ANXA1	16
APBB1IP	17, 18
APEX1	19
ARHGAP25	17
ARHGAP35	20
ASPA	21
ASPM	22
ATF5	23
ATF6alpha	24
ARID1A	25
B7-H4	26
BACE2	27
Bax	28
Bcl-2	28, 29
BHMT2	30
Birc2 (cIAP1)	31
Birc3 (cIAP2)	31
BMP8A	32
BMPR2	33
BNIP3	17
BRAF	32
BZW1	14
C12orf75	22
C3AR1	34
CNN3	35
caprin1	36
CARD11	34
CASP3	6
CBLN4	14

CBX3	37
CBX4	38
CCDC152	39
CCL2	34
CCL5	40
CCL8	34, 40
CCN3	41
CCR4	40
CCR5	40
CD133	8, 42, 43
CD14	34
CD163	44
CD180	45
CD209	34
CD4	46
CD44	47
CD44V6	48
CD5	49
CD68	46
CD74	12
CD79A	50
CD8	51
CDC2	52
CDC20	53
CDCA4	54
CDK11	55
CDK9	56
CDR3	57
CGREF1	17
CHCHD8	23
CHIC2	39
CK1α	58
CLDN7	14
CLUAP1	59
c-MYC	29
COCH	60
COL13A1	17, 59
CORO6	17
CORT	17, 32
CPA6	21
CPE	61
CSE1L	62
CSF1R	46
CSF3R	34, 50

CTNNBIP1	59
CTTN	63
Cullin-1 (CUL1)	64
CXCL14	65
CXCR4	66, 67
Cyclin E1	68
CYP3A4	6
DCN	69
DeltaNp63	70
DLG4	17
DNAI1	45
DNALI1	30
DOCK2	30
DRP5	71
DSCR8	72
DYNLL2	73
EGFR	74
EHHADH	75
ENOPH1	23
EPB41	76
Eps15	77
ERCC1	78-85
ERCC2	79-81, 84-87
ERCC4	59, 85, 88
ERCC5	85
ESR1	89
EVI2A	90
EZH2	91
Ezrin	92-97
FAM83H	98
FANCF	88
FasL	6
FATE1	17, 45
FCER1G	34
FCGR2A	12
FCGR2B	34
FKBP11	18
FKBP14	99
FLNA	15
FOXM1	100
FOXP3	51
FPR1	34
FTL	101
FTO	102, 103

FUCA1	15, 17
GAGE1	72
GAL	32
GCA	59
GJA5	18
GLDC	104
GLS1	105
GNRH1	32
GNRH2	106
GPR110	107
GPR142	39
GRF-1	108
GRN	32, 34
GSTP1	2, 4, 87, 109-111
GZMB	14
HCK	34
HER-2	112
HIPK2	49
HLA-DMA	22
HLA-DRA	22
HMBOX1	113
HMOX1	34
HOXC8	114
HSP90B1	115
HSPD1	65
IFNgamma	116
IGF2BP2	103
IGHG2	34
IGHG3	34
IGLC2	34
IKZF1	115
IL10	34, 117
IL12	118
IL2RA	34
IL2RG	34
IL33	119-121
IL-6	122
ING2	27
ING4	123
JAG2	59
JAK2	124
KAZALD1	59
KCNJ15	21
Keap1	125

Ki-67	126
KIF25	17
KRT5	49
KRTCAP3	14
KRTDAP	14
LAMA3	15
LAMP3	127
LANCL3	21
LCP2	34
LDOC1	128
LEPRE1	129
LGALS1	15
LILRB3	34
LOC286367	23
LRH-1	130
LRRC15	131
LY86	61
LY9	14
LYL1	39
LYZ	22
MACC1	132
MAP2K4	133
MAP3K5	49
MAPK7	133, 134
MATN2	22
MATN3	15
MCM2	135
MCM3	135
MDM2	106, 136
Med19	137
MELK	138
METTL3	102
mGluR1	139
mGluR4	139
mGluR5	139
MIG-7	140
MMP13	31, 141
MMP2	142, 143
MMP27	39
MMP9	67
MMS19L	144, 145
MCT4	146
MSH2	6
MSH6	62, 88

MSR1	34, 147
MT2A	148
MTAP	149
MTNR1B	50
MUC1	59
MYC	17, 39, 45
MYL1	72
MYOM2	60
Nestin	8
NF-kappaB	150
NKD1	151
Notch3	152
NPC2	18
NPPC	50
NPRL2	153
Nrf2	125
NSD2	154
NUBP1	17
NUPR1	22
ONZIN	155
OPG	156
p14ARF	89
p27	157
P4HA1	5, 69
p53	28, 29, 156, 158, 159
p62	160
PCK2	161
PDE1B	60
PDGFRA	162
PDK1	34
PD-L1	163
PEA15	22
PEF1	17
PFKFB2	14
PHC3	164
pIgR	165
PIK3R5	34
PIKFYVE	73
PKR	166
PLA2G16	167
PLEKHG1	72
PLK2	168
PLOD1	169
PML	76

Polo-like kinase (Plk) 1	170
PPARG	34
PQBP1	161
PRC1	171
PRC2	171
PRF1	34
PCNA	172
PROSER2	45
PSAT1	16
PSMD10	32
PTEN	150, 173, 174
PTPN22	14
PTPRC	34
QKI2	175
RAB40C	59
RAD23A	17
RB1	176
REM1	21
RHBDL2	17
RIPK3	30
RPL34	177
Runx2	178
S100A13	17
S100A4	179
SAXO2	72
SCARA5	21
SCN1A	72
SCUBE3	65
SDC3	32
SETD2	154
SGCG	15
SIRPA	59
SIRT6	180
SLC11A1	34
SLC19A1	181
SLC24A4	21
SLC38A5	17
SMAR1	182
SNP309	136
SPAG5	183
STAT3	124, 184, 185
STAT5A	186
STC2	5, 17, 187
SULT1A3	11

survivin	188
SUZ12	115
TCN2	59
Tim-3	189
TLR1	34
TLR2	34
TLR7	34, 147
TLR8	34
TMEM125	72
Tmem41b	141
TNFRSF11B	32
TNFRSF21	32
TNFSF8	34
TP53	190
TRA	57
Transferrin receptor-1	191
TREX1	192
TRH	21
TRIM10	193
TRIM66	194
TRIM68	73
Trps1	195
TSSC3	196, 197
Twist-1	198
UGT3A2	72
URG4	199
USP11	17, 59
VAV1	32, 34
VEGF	191, 200-203
VEGFA	15, 32
VEGFR	204
VEGFR2	205
vitamin D receptor (VDR)	206
VM	207
WNT5A	15
WNT6	208
XBP1	209
XPD	210
XPG	144, 145
XRCC3	211
XRCC6	212
YTHDC1	102

References

1. Caronia D, Patino-Garcia A, Perez-Martinez A, Pita G, Moreno LT, Zalacain-Diez M, Molina B, Colmenero I, Sierrasesumaga L, Benitez J, Gonzalez-Neira A. Effect of ABCB1 and ABCC3 polymorphisms on osteosarcoma survival after chemotherapy: a pharmacogenetic study. *PLoS One* 2011;**6**:e26091

2. Li JZ, Tian ZQ, Jiang SN, Feng T. Effect of variation of ABCB1 and GSTP1 on osteosarcoma survival after chemotherapy. *Genet Mol Res* 2014;**13**:3186-92

3. Yang J, Wang ZG, Cai HQ, Li YC, Xu YL. Effect of variation of ABCB1 and ABCC3 genotypes on the survival of bone tumor cases after chemotherapy. *Asian Pac J Cancer Prev* 2013;**14**:4595-8

4. Liu S, Yi Z, Ling M, Shi J, Qiu Y, Yang S. Predictive potential of ABCB1, ABCC3, and GSTP1 gene polymorphisms on osteosarcoma survival after chemotherapy. *Tumour Biol* 2014;**35**:9897-904

5. Yang M, Ma X, Wang Z, Zhang T, Hua Y, Cai Z. Identification of a novel glycolysis-related gene signature for predicting the prognosis of osteosarcoma patients. *Aging (Albany NY)* 2021;**13**:12896-918

6. Hagleitner MM, Coenen MJ, Gelderblom H, Makkinje RR, Vos HI, de Bont ES, van der Graaf WT, Schreuder HW, Flucke U, van Leeuwen FN, Hoogerbrugge PM, Guchelaar HJ, te Loo DM. A First Step toward Personalized Medicine in Osteosarcoma: Pharmacogenetics as Predictive Marker of Outcome after Chemotherapy-Based Treatment. *Clinical cancer research : an official journal of the American Association for Cancer Research* 2015;**21**:3436-41

7. Shu H, Yuan B, Huang Y, Wang L, He B, Sun Q, Sun L. High expression of ABCG2 is associated with chemotherapy resistance of osteosarcoma. *Journal of orthopaedic surgery and research* 2021;**16**:85

8. Zambo I, Hermanova M, Zapletalova D, Skoda J, Mudry P, Kyr M, Zitterbart K, Sterba J, Veselska R. Expression of nestin, CD133 and ABCG2 in relation to the clinical outcome in pediatric sarcomas. *Cancer Biomark* 2016;**17**:107-16

9. Wang F, Ke ZF, Sun SJ, Chen WF, Yang SC, Li SH, Mao XP, Wang LT. Oncogenic roles of astrocyte elevated gene-1 (AEG-1) in osteosarcoma progression and prognosis. *Cancer Biol Ther* 2011;**12**:539-48

10. Wang J, Ni J, Song D, Ding M, Huang J, Li W, He G. MAT1 facilitates the lung metastasis of osteosarcoma through upregulation of AKT1 expression. *Life sciences* 2019;**234**:116771

11. Chen X, Yang TT, Zhou Y, Wang W, Qiu XC, Gao J, Li CX, Long H, Ma BA, Ma Q, Zhang XZ, Yang LJ, Fan QY. Proteomic profiling of osteosarcoma cells identifies ALDOA and SULT1A3 as negative survival markers of human osteosarcoma. *Molecular carcinogenesis* 2014;**53**:138-44

12. Li M, Jin X, Li H, Wu G, Wang S, Yang C, Deng S. Key genes with prognostic values in suppression of osteosarcoma metastasis using comprehensive analysis. *BMC cancer* 2020;**20**:65

13. Wang X, Hu Z, Wang Z, Cui Y, Cui X. Angiopoietin-like protein 2 is an important facilitator of tumor proliferation, metastasis, angiogenesis and glycolysis in osteosarcoma. *American journal of translational research* 2019;**11**:6341-55

14. Wang F, Qin G, Liu J, Wang X, Ye B. Integrated Genome-Wide Methylation and Expression Analyses Reveal Key Regulators in Osteosarcoma. *Computational and mathematical methods in medicine* 2020;**2020**:7067649

15. Yiqi Z, Ziyun L, Qin F, Xingli W, Liyu Y. Identification of 9-Gene Epithelial-Mesenchymal Transition Related Signature of Osteosarcoma by Integrating Multi Cohorts. *Technol Cancer Res Treat* 2020;**19**:1533033820980769

16. Tang X, Luo L, Li Y, Wu H, Hu Q, Yue H, He X, Zou J, Min S. Therapeutic potential of targeting HSPA5 through dual regulation of two candidate prognostic biomarkers ANXA1 and PSAT1 in osteosarcoma. *Aging (Albany NY)* 2020;**13**:1212-35

17. Qiu Z, Du X, Chen K, Dai Y, Wang S, Xiao J, Li G. Gene signatures with predictive and prognostic survival values in human osteosarcoma. *PeerJ* 2021;**9**:e10633

18. Cao M, Zhang J, Xu H, Lin Z, Chang H, Wang Y, Huang X, Chen X, Wang H, Song Y. Identification and Development of a Novel 4-Gene Immune-Related Signature to Predict Osteosarcoma Prognosis. *Front Mol Biosci* 2020;**7**:608368

19. Yang J, Yang D, Cogdell D, Du X, Li H, Pang Y, Sun Y, Hu L, Sun B, Trent J, Chen K, Zhang W. APEX1 gene amplification and its protein overexpression in osteosarcoma: correlation with recurrence, metastasis, and survival. *Technol Cancer Res Treat* 2010;**9**:161-9

20. Zhao J, Xu H, He M, Wang Z, Wu Y. Rho GTPase-activating protein 35 rs1052667 polymorphism and osteosarcoma risk and prognosis. *Biomed Res Int* 2014;**2014**:396947

21. Wu G, Zhang M. A novel risk score model based on eight genes and a nomogram for predicting overall survival of patients with osteosarcoma. *BMC cancer* 2020;**20**:456

22. Zhang H, Guo L, Zhang Z, Sun Y, Kang H, Song C, Liu H, Lei Z, Wang J, Mi B, Xu Q, Guan H, Li F. Co-Expression Network Analysis Identified Gene Signatures in Osteosarcoma as a Predictive Tool for Lung Metastasis and Survival. *Journal of Cancer* 2019;**10**:3706-16

23. Luo Y, Lv B, He S, Zou K, Hu K. Identification of Gene as Predictive Biomarkers for the Occurrence and Recurrence of Osteosarcoma. *International journal of general medicine* 2021;**14**:1773-83

24. Yarapureddy S, Abril J, Foote J, Kumar S, Asad O, Sharath V, Faraj J, Daniel D, Dickman P,

White-Collins A, Hingorani P, Sertil AR. ATF6α Activation Enhances Survival against Chemotherapy and Serves as a Prognostic Indicator in Osteosarcoma. *Neoplasia (New York, NY)* 2019;**21**:516-32

25. Xu N, Wang L, Sun P, Xu S, Fu S, Sun Z. Low Arid1a Expression Correlates with Poor Prognosis and Promotes Cell Proliferation and Metastasis in Osteosarcoma. *Pathology oncology research : POR* 2019;**25**:875-81

26. Dong Q, Ma X. B7-H4 expression is associated with tumor progression and prognosis in patients with osteosarcoma. *Biomed Res Int* 2015;**2015**:156432

27. Goh TS, Lee JS, Il Kim J, Park YG, Pak K, Jeong DC, Oh SO, Kim YH. Prognostic scoring system for osteosarcoma using network-regularized high-dimensional Cox-regression analysis and potential therapeutic targets. *Journal of cellular physiology* 2019;**234**:13851-57

28. Kaseta MK, Khaldi L, Gomatos IP, Tzagarakis GP, Alevizos L, Leandros E, Papagelopoulos PJ, Soucacos PN. Prognostic value of bax, bcl-2, and p53 staining in primary osteosarcoma. *Journal of surgical oncology* 2008;**97**:259-66

29. Wu X, Cai ZD, Lou LM, Zhu YB. Expressions of p53, c-MYC, BCL-2 and apoptotic index in human osteosarcoma and their correlations with prognosis of patients. *Cancer epidemiology* 2012;**36**:212-6

30. Tian W, Li Y, Zhang J, Li J, Gao J. Combined analysis of DNA methylation and gene expression profiles of osteosarcoma identified several prognosis signatures. *Gene* 2018;**650**:7-14

31. Ma O, Cai WW, Zender L, Dayaram T, Shen J, Herron AJ, Lowe SW, Man TK, Lau CC, Donehower LA. MMP13, Birc2 (cIAP1), and Birc3 (cIAP2), amplified on chromosome 9, collaborate with p53 deficiency in mouse osteosarcoma progression. *Cancer Res* 2009;**69**:2559-67

32. Wu ZL, Deng YJ, Zhang GZ, Ren EH, Yuan WH, Xie QQ. Development of a novel

immune-related genes prognostic signature for osteosarcoma. *Scientific reports* 2020;**10**:18402

33. Cao H, Quan S, Zhang L, Chen Y, Jiao G. BMPR2 expression level is correlated with low immune infiltration and predicts metastasis and poor survival in osteosarcoma. *Oncology letters* 2021;**21**:391

34. Zhang C, Zheng JH, Lin ZH, Lv HY, Ye ZM, Chen YP, Zhang XY. Profiles of immune cell infiltration and immune-related genes in the tumor microenvironment of osteosarcoma. *Aging (Albany NY)* 2020;**12**:3486-501

35. Dai F, Luo F, Zhou R, Zhou Q, Xu J, Zhang Z, Xiao J, Song L. Calponin 3 is associated with poor prognosis and regulates proliferation and metastasis in osteosarcoma. *Aging (Albany NY)* 2020;**12**:14037-49

36. Tan N, Dai L, Liu X, Pan G, Chen H, Huang J, Xu Q. Upregulation of caprin1 expression is associated with poor prognosis in hepatocellular carcinoma. *Pathology, research and practice* 2017;**213**:1563-67

37. Ma C, Nie XG, Wang YL, Liu XH, Liang X, Zhou QL, Wu DP. CBX3 predicts an unfavorable prognosis and promotes tumorigenesis in osteosarcoma. *Mol Med Rep* 2019;**19**:4205-12

38. Yang J, Cheng D, Zhu B, Zhou S, Ying T, Yang Q. Chromobox Homolog 4 is Positively Correlated to Tumor Growth, Survival and Activation of HIF-1α Signaling in Human Osteosarcoma under Normoxic Condition. *Journal of Cancer* 2016;**7**:427-35

39. Li R, Wang G, Wu Z, Lu H, Li G, Sun Q, Cai M. Identification of 6 gene markers for survival prediction in osteosarcoma cases based on multi-omics analysis. *Exp Biol Med (Maywood)* 2021;**246**:1512-23

40. Zhang Z, Liu C, Liang T, Yu C, Qin Z, Zhou X, Xue J, Zeng H, Lu Z, Xu G, Wang Z, Chen J,

Jiang J, Zhan X. Establishment of immune prognostic signature and analysis of prospective molecular mechanisms in childhood osteosarcoma patients. *Medicine (Baltimore)* 2020;**99**:e23251

41. Perbal B, Zuntini M, Zambelli D, Serra M, Sciandra M, Cantiani L, Lucarelli E, Picci P, Scotlandi K. Prognostic value of CCN3 in osteosarcoma. *Clinical cancer research : an official journal of the American Association for Cancer Research* 2008;**14**:701-9

42. Xie Y, Huang J, Wu M, Zhou Y. Expression of CD133 protein in osteosarcoma and its relationship with the clinicopathological features and prognosis. *J Cancer Res Ther* 2018;**14**:892-95

43. He A, Qi W, Huang Y, Feng T, Chen J, Sun Y, Shen Z, Yao Y. CD133 expression predicts lung metastasis and poor prognosis in osteosarcoma patients: A clinical and experimental study. *Exp Ther Med* 2012;**4**:435-41

44. Zheng S, Peng J, Jia J, Wu T, Cheng X. Revealing the link between macrophage in microenvironment of osteosarcoma and poor prognosis by utilizing the Integrated analysis. *Journal of musculoskeletal & neuronal interactions* 2021;**21**:130-37

45. Chen J, Guo X, Zeng G, Liu J, Zhao B. Transcriptome Analysis Identifies Novel Prognostic Genes in Osteosarcoma. *Computational and mathematical methods in medicine* 2020;**2020**:8081973

46. Song YJ, Xu Y, Zhu X, Fu J, Deng C, Chen H, Xu H, Song G, Lu J, Tang Q, Wang J. Immune Landscape of the Tumor Microenvironment Identifies Prognostic Gene Signature CD4/CD68/CSF1R in Osteosarcoma. *Front Oncol* 2020;**10**:1198

47. Xiao Z, Wan J, Nur AA, Dou P, Mankin H, Liu T, Ouyang Z. Targeting CD44 by CRISPR-Cas9 in Multi-Drug Resistant Osteosarcoma Cells. *Cell Physiol Biochem* 2018;**51**:1879-93

48. Zhang Y, Ding C, Wang J, Sun G, Cao Y, Xu L, Zhou L, Chen X. Prognostic significance of CD44V6 expression in osteosarcoma: a meta-analysis. *Journal of orthopaedic surgery and research*

2015;**10**:187

49. Li Y, Ge F, Wang S. Four genes predict the survival of osteosarcoma patients based on TARGET database. *J Bioenerg Biomembr* 2020;**52**:291-99

50. Yin CD, Hou YL, Liu XR, He YS, Wang XP, Li CJ, Tan XH, Liu J. Development of an immune-related prognostic index associated with osteosarcoma. *Bioengineered* 2021;**12**:172-82

51. Fritzsching B, Fellenberg J, Moskovszky L, Sápi Z, Krenacs T, Machado I, Poeschl J, Lehner B, Szendrõi M, Bosch AL, Bernd L, Csóka M, Mechtersheimer G, Ewerbeck V, Kinscherf R, Kunz P. CD8(+)/FOXP3(+)-ratio in osteosarcoma microenvironment separates survivors from non-survivors: a multicenter validated retrospective study. *Oncoimmunology* 2015;**4**:e990800

52. Hou G, Chen B, Xu W, Zhao H, Liu K, Yao H. Expression level of CDC2 gene in osteosarcoma and its clinical significance. *Oncology letters* 2018;**15**:7884-88

53. Wu MS, Ma QY, Liu DD, Li XJ, Deng LJ, Li N, Shen J, Zhao Z, Chen JX. CDC20 and its downstream genes: potential prognosis factors of osteosarcoma. *Int J Clin Oncol* 2019;**24**:1479-89

54. Hao S, Zhu J, Zhang X, Qiu J, Xuan Q, Ye L. Comprehensive Analysis of Aerobic Exercise-Related Genes Identifies CDCA4 That Promotes the Progression of Osteosarcoma. *Frontiers in genetics* 2021;**12**:637755

55. Liao Y, Sassi S, Halvorsen S, Feng Y, Shen J, Gao Y, Cote G, Choy E, Harmon D, Mankin H, Hornicek F, Duan Z. Androgen receptor is a potential novel prognostic marker and oncogenic target in osteosarcoma with dependence on CDK11. *Scientific reports* 2017;**7**:43941

56. Ma H, Seebacher NA, Hornicek FJ, Duan Z. Cyclin-dependent kinase 9 (CDK9) is a novel prognostic marker and therapeutic target in osteosarcoma. *EBioMedicine* 2019;**39**:182-93

57. Yeagley M, Chobrutskiy BI, Gozlan EC, Medikonda N, Patel DN, Falasiri S, Callahan BM, Huda

T, Blanck G. Electrostatic Complementarity of T-Cell Receptor-Alpha CDR3 Domains and Mutant Amino Acids Is Associated with Better Survival Rates for Sarcomas. *Pediatric hematology and oncology* 2021;**38**:251-64

58. Wang X, Qin G, Liang X, Wang W, Wang Z, Liao D, Zhong L, Zhang R, Zeng YX, Wu Y, Kang T. Targeting the CK1α/CBX4 axis for metastasis in osteosarcoma. *Nature communications* 2020;**11**:1141

59. Rothzerg E, Xu J, Wood D, Koks S. 12 Survival-related differentially expressed genes based on the TARGET-osteosarcoma database. *Exp Biol Med (Maywood)* 2021;**246**:2072-81

60. Wen C, Wang H, Wang H, Mo H, Zhong W, Tang J, Lu Y, Zhou W, Tan A, Liu Y, Xie W. A three-gene signature based on tumour microenvironment predicts overall survival of osteosarcoma in adolescents and young adults. *Aging (Albany NY)* 2020;**13**:619-45

61. Shi Y, He R, Zhuang Z, Ren J, Wang Z, Liu Y, Wu J, Jiang S, Wang K. A risk signature-based on metastasis-associated genes to predict survival of patients with osteosarcoma. *J Cell Biochem* 2020;**121**:3479-90

62. Cheng DD, Lin HC, Li SJ, Yao M, Yang QC, Fan CY. CSE1L interaction with MSH6 promotes osteosarcoma progression and predicts poor patient survival. *Scientific reports* 2017;**7**:46238

63. Folio C, Zalacain M, Zandueta C, Ormazabal C, Sierrasesumaga L, San Julian M, de las Rivas J, Toledo G, Lecanda F, Patino-Garcia A. Cortactin (CTTN) overexpression in osteosarcoma correlates with advanced stage and reduced survival. *Cancer Biomark* 2011;**10**:35-41

64. Cheng Q, Yin G. Cullin-1 regulates MG63 cell proliferation and metastasis and is a novel prognostic marker of osteosarcoma. *The International journal of biological markers* 2017;**32**:e202-e09

65. Liang W, Yang C, Peng J, Qian Y, Wang Z. The Expression of HSPD1, SCUBE3, CXCL14 and Its Relations with the Prognosis in Osteosarcoma. *Cell Biochem Biophys* 2015;**73**:763-8

66. Li YJ, Dai YL, Zhang WB, Li SJ, Tu CQ. Clinicopathological and prognostic significance of chemokine receptor CXCR4 in patients with bone and soft tissue sarcoma: a meta-analysis. *Clin Exp Med* 2017;**17**:59-69

67. Ren Z, Liang S, Yang J, Han X, Shan L, Wang B, Mu T, Zhang Y, Yang X, Xiong S, Wang G. Coexpression of CXCR4 and MMP9 predicts lung metastasis and poor prognosis in resected osteosarcoma. *Tumour Biol* 2016;**37**:5089-96

68. Wei R, Thanindratarn P, Dean DC, Hornicek FJ, Guo W, Duan Z. Cyclin E1 is a prognostic biomarker and potential therapeutic target in osteosarcoma. *Journal of orthopaedic research : official publication of the Orthopaedic Research Society* 2020;**38**:1952-64

69. Fu Y, Bao Q, Liu Z, He G, Wen J, Liu Q, Xu Y, Jin Z, Zhang W. Development and Validation of a Hypoxia-Associated Prognostic Signature Related to Osteosarcoma Metastasis and Immune Infiltration. *Front Cell Dev Biol* 2021;**9**:633607

70. Cam M, Gardner HL, Roberts RD, Fenger JM, Guttridge DC, London CA, Cam H. DeltaNp63 mediates cellular survival and metastasis in canine osteosarcoma. *Oncotarget* 2016;**7**:48533-46

71. Wang L, Liu W, Tang H, Xie X, Zou C, Wang Y, Gao Z, Yin J. DRP5 is involved in cancer cell growth and predicts poor prognosis in human osteosarcoma. *Cancer medicine* 2017;**6**:982-93

72. Wu B, Wang Z, Lin N, Yan X, Lv Z, Ying Z, Ye Z. A panel of eight mRNA signatures improves prognosis prediction of osteosarcoma patients. *Medicine (Baltimore)* 2021;**100**:e24118

73. Jiang J, Liu D, Xu G, Liang T, Yu C, Liao S, Chen L, Huang S, Sun X, Yi M, Zhang Z, Lu Z, Wang Z, Chen J, Chen T, Li H, Yao Y, Chen W, Guo H, Liu C, Zhan X. TRIM68, PIKFYVE, and

DYNLL2: The Possible Novel Autophagy- and Immunity-Associated Gene Biomarkers for Osteosarcoma Prognosis. *Front Oncol* 2021;**11**:643104

74. Selvarajah GT, Verheije MH, Kik M, Slob A, Rottier PJ, Mol JA, Kirpensteijn J. Expression of epidermal growth factor receptor in canine osteosarcoma: association with clinicopathological parameters and prognosis. *Vet J* 2012;**193**:412-9

75. Cui J, Yi G, Li J, Li Y, Qian D. Increased EHHADH Expression Predicting Poor Survival of Osteosarcoma by Integrating Weighted Gene Coexpression Network Analysis and Experimental Validation. *Biomed Res Int* 2021;**2021**:9917060

76. Liu S, Liu J, Yu X, Shen T, Fu Q. Identification of a Two-Gene (PML-EPB41) Signature With Independent Prognostic Value in Osteosarcoma. *Front Oncol* 2019;**9**:1578

77. Yu H, Qu G, Wang Y, Mai W, Bao JJ, Song C, Yao M. The expression of Eps15 homology domain 1 is negatively correlated with disease-free survival and overall survival of osteosarcoma patients. *Journal of orthopaedic surgery and research* 2019;**14**:103

78. Obiedat H, Alrabadi N, Sultan E, Al Shatti M, Zihlif M. The effect of ERCC1 and ERCC2 gene polymorphysims on response to cisplatin based therapy in osteosarcoma patients. *BMC Med Genet* 2018;**19**:112

79. Zhang Q, Lv LY, Li BJ, Zhang J, Wei F. Investigation of ERCC1 and ERCC2 gene polymorphisms and response to chemotherapy and overall survival in osteosarcoma. *Genet Mol Res* 2015;**14**:11235-41

80. Cao ZH, Yin HP, Jiang N, Yu B. Association between ERCC1 and ERCC2 gene polymorphisms and chemotherapy response and overall survival in osteosarcoma. *Genet Mol Res* 2015;**14**:10145-51

81. Hao T, Feng W, Zhang J, Sun YJ, Wang G. Association of four ERCC1 and ERCC2 SNPs with

survival of bone tumour patients. *Asian Pac J Cancer Prev* 2012;**13**:3821-4

82. Ji WP, He NB. Investigation on the DNA repaired gene polymorphisms and response to chemotherapy and overall survival of osteosarcoma. *International journal of clinical and experimental pathology* 2015;**8**:894-9

83. Sun Y, Wu Y, Li W, Kong Z, Zou X. Genetic polymorphisms in nucleotide excision repair pathway influences response to chemotherapy and overall survival in osteosarcoma. *International journal of clinical and experimental pathology* 2015;**8**:7905-12

84. Wang MJ, Zhu Y, Guo XJ, Tian ZZ. Genetic variability of genes involved in DNA repair influence treatment outcome in osteosarcoma. *Genet Mol Res* 2015;**14**:11652-7

85. Li C, Yu X, Guo D, Liu G, Zhang K, Teng Q, Lin H. Association between common polymorphisms in ERCC gene and prognosis of osteosarcoma in patients treated with chemotherapy: a meta-analysis. *OncoTargets and therapy* 2018;**11**:3495-504

86. Liu ZF, Asila AL, Aikenmu K, Zhao J, Meng QC, Fang R. Influence of ERCC2 gene polymorphisms on the treatment outcome of osteosarcoma. *Genet Mol Res* 2015;**14**:12967-72

87. Yang LM, Li XH, Bao CF. Glutathione S-transferase P1 and DNA polymorphisms influence response to chemotherapy and prognosis of bone tumors. *Asian Pac J Cancer Prev* 2012;**13**:5883-6

88. Huang C, Zhu X, Xiong W, Zhao X, Xu R. A case report of primary osteosarcoma originating from kidney. *Medicine (Baltimore)* 2019;**98**:e14234

89. Sonaglio V, de Carvalho AC, Toledo SR, Salinas-Souza C, Carvalho AL, Petrilli AS, de Camargo B, Vettore AL. Aberrant DNA methylation of ESR1 and p14ARF genes could be useful as prognostic indicators in osteosarcoma. *OncoTargets and therapy* 2013;**6**:713-23

90. Li S, Yang F, Yang YK, Zhou Y. Increased expression of ecotropic viral integration site 2A

indicates a poor prognosis and promotes osteosarcoma evolution through activating MEK/ERK pathway. *Journal of receptor and signal transduction research* 2019;**39**:368-72

91. Sun R, Shen J, Gao Y, Zhou Y, Yu Z, Hornicek F, Kan Q, Duan Z. Overexpression of EZH2 is associated with the poor prognosis in osteosarcoma and function analysis indicates a therapeutic potential. *Oncotarget* 2016;**7**:38333-46

92. Zhao DH, Zhu J, Wang WB, Dong F, Zhang Q, Fan HW, Zhang JZ, Wang YM. Correlations of ezrin expression with pathological characteristics and prognosis of osteosarcoma: a meta-analysis. *ScientificWorldJournal* 2014;**2014**:837543

93. Lun DX, Hu YC, Xu ZW, Xu LN, Wang BW. The prognostic value of elevated ezrin in patients with osteosarcoma. *Tumour Biol* 2014;**35**:1263-6

94. Wang Z, He ML, Zhao JM, Qing HH, Wu Y. Meta-analysis of associations of the ezrin gene with human osteosarcoma response to chemotherapy and prognosis. *Asian Pac J Cancer Prev* 2013;**14**:2753-8

95. Ferrari S, Zanella L, Alberghini M, Palmerini E, Staals E, Bacchini P. Prognostic significance of immunohistochemical expression of ezrin in non-metastatic high-grade osteosarcoma. *Pediatr Blood Cancer* 2008;**50**:752-6

96. Li H, Min D, Zhao H, Wang Z, Qi W, Zheng S, Tang L, He A, Sun Y, Yao Y, Shen Z. The Prognostic Role of Ezrin Immunoexpression in Osteosarcoma: A Meta-Analysis of Published Data. *PLoS One* 2013;**8**:e64513

97. Wang YF, Shen JN, Xie XB, Wang J, Huang G. Expression change of ezrin as a prognostic factor in primary osteosarcoma. *Medical oncology (Northwood, London, England)* 2011;**28 Suppl 1**:S636-43

98. Kim KM, Hussein UK, Park SH, Kang MA, Moon YJ, Zhang Z, Song Y, Park HS, Bae JS, Park BH, Ha SH, Moon WS, Kim JR, Jang KY. FAM83H is involved in stabilization of β-catenin and progression of osteosarcomas. *Journal of experimental & clinical cancer research : CR* 2019;**38**:267

99. Huang Z, Li J, Du S, Tang Y, Huang L, Xiao L, Tong P. FKBP14 overexpression contributes to osteosarcoma carcinogenesis and indicates poor survival outcome. *Oncotarget* 2016;**7**:39872-84

100. Hu K, Xie W, Ni S, Yan S, Tian G, Qi W, Duan Y. Cadmium chloride enhances cisplatin sensitivity in osteosarcoma cells by reducing FOXM1 expression. *Oncol Rep* 2020;**44**:650-60

101. Yu GH, Fu L, Chen J, Wei F, Shi WX. Decreased expression of ferritin light chain in osteosarcoma and its correlation with epithelial-mesenchymal transition. *Eur Rev Med Pharmacol Sci* 2018;**22**:2580-87

102. Zhang W, Wang L, Zhang P, Zhang Q. m6A regulators are associated with osteosarcoma metastasis and have prognostic significance: A study based on public databases. *Medicine (Baltimore)* 2021;**100**:e25952

103. Liu H, Qin G, Ji Y, Wang X, Bao H, Guan X, Wei A, Cai Z. Potential role of m6A RNA methylation regulators in osteosarcoma and its clinical prognostic value. *Journal of orthopaedic surgery and research* 2021;**16**:294

104. Koster R, Panagiotou OA, Wheeler WA, Karlins E, Gastier-Foster JM, Caminada de Toledo SR, Petrilli AS, Flanagan AM, Tirabosco R, Andrulis IL, Wunder JS, Gokgoz N, Patiño-Garcia A, Lecanda F, Serra M, Hattinger C, Picci P, Scotlandi K, Thomas DM, Ballinger ML, Gorlick R, Barkauskas DA, Spector LG, Tucker M, Belynda DH, Yeager M, Hoover RN, Wacholder S, Chanock SJ, Savage SA, Mirabello L. Genome-wide association study identifies the GLDC/IL33 locus associated with survival of osteosarcoma patients. *International journal of cancer* 2018;**142**:1594-601

105. Zhang SP, Li X, Li H, Sun XH, Yan XF. Significance of neoadjuvant chemotherapy (NACT) in limb salvage treatment of osteosarcoma and its effect on GLS1 expression. *Eur Rev Med Pharmacol Sci* 2018;**22**:6538-44

106. Feng W, Wang Z, Feng D, Zhu Y, Zhang K, Huang W. The effects of common variants in MDM2 and GNRH2 genes on the risk and survival of osteosarcoma in Han populations from Northwest China. *Scientific reports* 2020;**10**:15939

107. Liu Z, Zhang G, Zhao C, Li J. Clinical Significance of G Protein-Coupled Receptor 110 (GPR110) as a Novel Prognostic Biomarker in Osteosarcoma. *Medical science monitor : international medical journal of experimental and clinical research* 2018;**24**:5216-24

108. Zhao J, Xu H, He M, Wu Y. Glucocorticoid receptor DNA binding factor 1 expression and osteosarcoma prognosis. *Tumour Biol* 2014;**35**:12449-58

109. Pu F, Chen F, Chen S, Wang B, Liu J, Shao Z. Association between GSTP1 polymorphisms and prognosis of osteosarcoma in patients treated with chemotherapy: a meta-analysis. *OncoTargets and therapy* 2015;**8**:1835-42

110. Zhang SL, Mao NF, Sun JY, Shi ZC, Wang B, Sun YJ. Predictive potential of glutathione S-transferase polymorphisms for prognosis of osteosarcoma patients on chemotherapy. *Asian Pac J Cancer Prev* 2012;**13**:2705-9

111. Pasello M, Michelacci F, Scionti I, Hattinger CM, Zuntini M, Caccuri AM, Scotlandi K, Picci P, Serra M. Overcoming glutathione S-transferase P1-related cisplatin resistance in osteosarcoma. *Cancer Res* 2008;**68**:6661-8

112. Zhang Q, Liu F, Wang B, Li Z, Zhou D, Yang Q, Dong J, Li J. HER-2 expression in biopsy and surgical specimen on prognosis of osteosarcoma: A systematic review and meta-analysis of 16 studies.

Medicine (Baltimore) 2016;**95**:e3661

113. Chen S, Li Y, Zhi S, Ding Z, Wang W, Peng Y, Huang Y, Zheng R, Yu H, Wang J, Hu M, Miao J, Li J. WTAP promotes osteosarcoma tumorigenesis by repressing HMBOX1 expression in an m(6)A-dependent manner. *Cell death & disease* 2020;**11**:659

114. Cheng L, Wei X, Zhao K, Wu F, Lu W, Tong S, Yu G. The predictive potential and oncogenic effects of HOXC8 expression on osteosarcoma. *Tumour Biol* 2016;**37**:14961-67

115. Zhang Y, Yang F. Analyzing the disease module associated with osteosarcoma via a network- and pathway-based approach. *Exp Ther Med* 2018;**16**:2584-92

116. Yoshida K, Okamoto M, Sasaki J, Kuroda C, Ishida H, Ueda K, Ideta H, Kamanaka T, Sobajima A, Takizawa T, Tanaka M, Aoki K, Uemura T, Kato H, Haniu H, Saito N. Anti-PD-1 antibody decreases tumour-infiltrating regulatory T cells. *BMC cancer* 2020;**20**:25

117. Cui Y, Zhu JJ, Ma CB, Cui K, Wang F, Ni SH, Zhang ZY. Interleukin 10 gene -1082A/G polymorphism is associated with osteosarcoma risk and poor outcomes in the Chinese population. *Tumour Biol* 2016;**37**:4517-22

118. Zalacain M, Bunuales M, Marrodan L, Labiano S, Gonzalez-Huarriz M, Martinez-Velez N, Laspidea V, Puigdelloses M, Garcia-Moure M, Gonzalez-Aparicio M, Hernandez-Alcoceba R, Alonso MM, Patino-Garcia A. Local administration of IL-12 with an HC vector results in local and metastatic tumor control in pediatric osteosarcoma. *Mol Ther Oncolytics* 2021;**20**:23-33

119. Lin Q, Han J, Sun Q, Wen L, Wang S. Functional variant of IL33 is associated with survival of osteosarcoma patients. *Journal of bone oncology* 2020;**20**:100270

120. Koster R, Panagiotou OA, Wheeler WA, Karlins E, Gastier-Foster JM, Caminada de Toledo SR, Petrilli AS, Flanagan AM, Tirabosco R, Andrulis IL, Wunder JS, Gokgoz N, Patino-Garcia A, Lecanda

F, Serra M, Hattinger C, Picci P, Scotlandi K, Thomas DM, Ballinger ML, Gorlick R, Barkauskas DA, Spector LG, Tucker M, Belynda DH, Yeager M, Hoover RN, Wacholder S, Chanock SJ, Savage SA, Mirabello L. Genome-wide association study identifies the GLDC/IL33 locus associated with survival of osteosarcoma patients. *International journal of cancer* 2018;**142**:1594-601

121. Kang C, Zhao J, Wang Y, Yang C, Chen J, Zhi L. Relationship of common variants in Interleukin 33 gene with susceptibility and prognosis of osteosarcoma in Han Chinese population. *Journal of Cancer* 2019;**10**:1138-44

122. Qi Y, Zhao C, Li H, Zhang B, Tada K, Abe H, Tada M. Genetic variations in interleukin-6 polymorphism and the association with susceptibility and overall survival of osteosarcoma. *Tumour Biol* 2016;**37**:9807-11

123. Li F, Sun J, Liu B, Zhang X, Zhou L, Pang J. The association of inhibitor of Growth 4 with its prognostic value in osteogenic sarcoma. *International journal of clinical and experimental pathology* 2017;**10**:10003-08

124. Huang L, Huang Z, Lin W, Wang L, Zhu X, Chen X, Yang S, Lv C. Salidroside suppresses the growth and invasion of human osteosarcoma cell lines MG63 and U2OS in vitro by inhibiting the JAK2/STAT3 signaling pathway. *Int J Oncol* 2019;**54**:1969-80

125. Zhang J, Wang X, Wu W, Dang H, Wang B. Expression of the Nrf2 and Keap1 proteins and their clinical significance in osteosarcoma. *Biochemical and biophysical research communications* 2016;**473**:42-46

126. Zeng M, Zhou J, Wen L, Zhu Y, Luo Y, Wang W. The relationship between the expression of Ki-67 and the prognosis of osteosarcoma. *BMC cancer* 2021;**21**:210

127. Liu S, Yue J, Du W, Han J, Zhang W. LAMP3 plays an oncogenic role in osteosarcoma cells

partially by inhibiting TP53. *Cell Mol Biol Lett* 2018;**23**:33

128. Yong BC, Lu JC, Xie XB, Su Q, Tan PX, Tang QL, Wang J, Huang G, Han J, Xu HW, Shen JN. LDOC1 regulates Wnt5a expression and osteosarcoma cell metastasis and is correlated with the survival of osteosarcoma patients. *Tumour Biol* 2017;**39**:1010428317691188

129. Huang Z, Wang Q, Wang Y, Zhao L, Cao Z, Cui C, Yu D, Liu B. Upregulated LEPRE1 correlates with poor outcome and its knockdown attenuates cells proliferation, migration and invasion in osteosarcoma. *Anti-cancer drugs* 2020;**31**:326-32

130. Song Y, An W, Wang H, Gao Y, Han J, Hao C, Chen L, Liu S, Xing Y. LRH1 Acts as an Oncogenic Driver in Human Osteosarcoma and Pan-Cancer. *Front Cell Dev Biol* 2021;**9**:643522

131. Cui J, Dean D, Wei R, Hornicek FJ, Ulmert D, Duan Z. Expression and clinical implications of leucine-rich repeat containing 15 (LRRC15) in osteosarcoma. *Journal of orthopaedic research : official publication of the Orthopaedic Research Society* 2020;**38**:2362-72

132. Zhang K, Zhang Y, Zhu H, Xue N, Liu J, Shan C, Zhu Q. High expression of MACC1 predicts poor prognosis in patients with osteosarcoma. *Tumour Biol* 2014;**35**:1343-50

133. Tesser-Gamba F, Petrilli AS, de Seixas Alves MT, Filho RJ, Juliano Y, Toledo SR. MAPK7 and MAP2K4 as prognostic markers in osteosarcoma. *Human pathology* 2012;**43**:994-1002

134. Tesser-Gamba F, Paolillo AT, Del Giudice Paniago M, Petrilli AS, Seixas Alves MT, Garcia Filho RJ, Toledo SRC. MAPK7 variants related to prognosis and chemotherapy response in osteosarcoma. *Ann Diagn Pathol* 2020;**46**:151482

135. Cheng DD, Zhang HZ, Yuan JQ, Li SJ, Yang QC, Fan CY. Minichromosome maintenance protein 2 and 3 promote osteosarcoma progression via DHX9 and predict poor patient prognosis. *Oncotarget* 2017;**8**:26380-93

136. Toffoli G, Biason P, Russo A, De Mattia E, Cecchin E, Hattinger CM, Pasello M, Alberghini M, Ferrari C, Scotlandi K, Picci P, Serra M. Effect of TP53 Arg72Pro and MDM2 SNP309 polymorphisms on the risk of high-grade osteosarcoma development and survival. *Clinical cancer research : an official journal of the American Association for Cancer Research* 2009;**15**:3550-6

137. Yu W, Zhang Z, Min D, Yang Q, Du X, Tang L, Lin F, Sun Y, Zhao H, Zheng S, He A, Li H, Yao Y, Shen Z. Mediator of RNA polymerase II transcription subunit 19 promotes osteosarcoma growth and metastasis and associates with prognosis. *Eur J Cancer* 2014;**50**:1125-36

138. Jeddo SFA, Wei X, Li K, Li X, Yang Q, Dongol S, Li J. Maternal embryonic leucine zipper kinase serves as a poor prognosis marker and therapeutic target in osteosarcoma. *Oncol Rep* 2020;**44**:1037-48

139. Yang W, Maolin H, Jinmin Z, Zhe W. High expression of metabotropic glutamate receptor 4: correlation with clinicopathologic characteristics and prognosis of osteosarcoma. *J Cancer Res Clin Oncol* 2014;**140**:419-26

140. Ren K, Zhang J, Gu X, Wu S, Shi X, Ni Y, Chen Y, Lu J, Gao Z, Wang C, Yao N. Migration-inducing gene-7 independently predicts poor prognosis of human osteosarcoma and is associated with vasculogenic mimicry. *Experimental cell research* 2018;**369**:80-89

141. Li GH, Liu X, Feng LJ, Zhang L. Expression of Tmem41b and MMP13 associated with poor outcome in osteosarcomas. *Neoplasma* 2021;

142. Wen X, Liu H, Yu K, Liu Y. Matrix metalloproteinase 2 expression and survival of patients with osteosarcoma: a meta-analysis. *Tumour Biol* 2014;**35**:845-8

143. Zhang M, Zhang X. Association of MMP-2 expression and prognosis in osteosarcoma patients. *International journal of clinical and experimental pathology* 2015;**8**:14965-70

144. Bai SB, Chen HX, Bao YX, Luo X, Zhong JJ. Predictive impact of common variations in DNA repair genes on clinical outcome of osteosarcoma. *Asian Pac J Cancer Prev* 2013;**14**:3677-80

145. Zhao YL, Yang LB, Geng XL, Zhou QL, Qin H, Yang L, Dong YZ, Zhong JJ. The association of XPG and MMS19L polymorphisms response to chemotherapy in osteosarcoma. *Pak J Med Sci* 2013;**29**:1225-9

146. Liu Y, Sun X, Huo C, Sun C, Zhu J. Monocarboxylate Transporter 4 (MCT4) Overexpression Is Correlated with Poor Prognosis of Osteosarcoma. *Medical science monitor : international medical journal of experimental and clinical research* 2019;**25**:4278-84

147. Chen Z, Huang H, Wang Y, Zhan F, Quan Z. Identification of Immune-Related Genes MSR1 and TLR7 in Relation to Macrophage and Type-2 T-Helper Cells in Osteosarcoma Tumor Micro-Environments as Anti-metastasis Signatures. *Front Mol Biosci* 2020;**7**:576298

148. Mangelinck A, da Costa MEM, Stefanovska B, Bawa O, Polrot M, Gaspar N, Fromigué O. MT2A is an early predictive biomarker of response to chemotherapy and a potential therapeutic target in osteosarcoma. *Scientific reports* 2019;**9**:12301

149. Zhi L, Liu D, Wu SG, Li T, Zhao G, Zhao B, Li M. Association of common variants in MTAP with susceptibility and overall survival of osteosarcoma: a two-stage population-based study in Han Chinese. *Journal of Cancer* 2016;**7**:2179-86

150. Gong T, Su X, Xia Q, Wang J, Kan S. Expression of NF-κB and PTEN in osteosarcoma and its clinical significance. *Oncology letters* 2017;**14**:6744-48

151. Chen X, Xu P, Zhu J, Liu F. Downregulation of NKD1 in human osteosarcoma and its clinical significance. *Mol Med Rep* 2018;**17**:1111-17

152. Tang XF, Cao Y, Peng DB, Zhao GS, Zeng Y, Gao ZR, Lv YF, Guo QN. Overexpression of

Notch3 is associated with metastasis and poor prognosis in osteosarcoma patients. *Cancer management and research* 2019;**11**:547-59

153. Gao Y, Wang J, Fan G. NPRL2 is an independent prognostic factor of osteosarcoma. *Cancer Biomark* 2012;**12**:31-6

154. Taylor EL, Westendorf JJ. Histone Mutations and Bone Cancers. *Adv Exp Med Biol* 2021;**1283**:53-62

155. Zhang Y, Hu Q, Li G, Li L, Liang S, Zhang Y, Liu J, Fan Z, Li L, Zhou B, Ruan Y, Yang X, Chen S, Mu T, Wang G, Xiong S. ONZIN Upregulation by Mutant p53 Contributes to Osteosarcoma Metastasis Through the CXCL5-MAPK Signaling Pathway. *Cell Physiol Biochem* 2018;**48**:1099-111

156. Velletri T, Huang Y, Wang Y, Li Q, Hu M, Xie N, Yang Q, Chen X, Chen Q, Shou P, Gan Y, Candi E, Annicchiarico-Petruzzelli M, Agostini M, Yang H, Melino G, Shi Y, Wang Y. Loss of p53 in mesenchymal stem cells promotes alteration of bone remodeling through negative regulation of osteoprotegerin. *Cell death and differentiation* 2021;**28**:156-69

157. Li Y, Nakka M, Kelly AJ, Lau CC, Krailo M, Barkauskas DA, Hicks JM, Man TK. p27 Is a Candidate Prognostic Biomarker and Metastatic Promoter in Osteosarcoma. *Cancer Res* 2016;**76**:4002-11

158. Wu J, Guo A, Li Q, Wang D. Meta-analysis of clinical significance of p53 protein expression in patients with osteosarcoma. *Future Oncol* 2017;**13**:1883-91

159. Yao D, Cai GH, Chen J, Ling R, Wu SX, Li YP. Prognostic value of p53 alterations in human osteosarcoma: a meta analysis. *International journal of clinical and experimental pathology* 2014;**7**:6725-33

160. Ma H, Li X, Wang J, Hornicek FJ, Garbutt CC, Chang X, Duan Z. Expression and Clinical

Implication of Autophagy-Associated Protein p62 in Osteosarcoma. *Oncology* 2018;**95**:52-60

161. Zhang Y, Zhao H, Xu W, Jiang D, Huang L, Li L. High Expression of PQBP1 and Low Expression of PCK2 are Associated with Metastasis and Recurrence of Osteosarcoma and Unfavorable Survival Outcomes of the Patients. *Journal of Cancer* 2019;**10**:2091-101

162. Sulzbacher I, Birner P, Dominkus M, Pichlhofer B, Mazal PR. Expression of platelet-derived growth factor-alpha receptor in human osteosarcoma is not a predictor of outcome. *Pathology* 2010;**42**:664-8

163. Liao Y, Chen L, Feng Y, Shen J, Gao Y, Cote G, Choy E, Harmon D, Mankin H, Hornicek F, Duan Z. Targeting programmed cell death ligand 1 by CRISPR/Cas9 in osteosarcoma cells. *Oncotarget* 2017;**8**:30276-87

164. Iwata S, Takenobu H, Kageyama H, Koseki H, Ishii T, Nakazawa A, Tatezaki S, Nakagawara A, Kamijo T. Polycomb group molecule PHC3 regulates polycomb complex composition and prognosis of osteosarcoma. *Cancer Sci* 2010;**101**:1646-52

165. Wang X, Du J, Gu P, Jin R, Lin X. Polymeric immunoglobulin receptor expression is correlated with poor prognosis in patients with osteosarcoma. *Mol Med Rep* 2014;**9**:2105-10

166. Piazzi M, Bavelloni A, Greco S, Focaccia E, Orsini A, Benini S, Gambarotti M, Faenza I, Blalock WL. Expression of the double-stranded RNA-dependent kinase PKR influences osteosarcoma attachment independent growth, migration, and invasion. *Journal of cellular physiology* 2020;**235**:1103-19

167. Liang S, Ren Z, Han X, Yang J, Shan L, Li L, Wang B, Zhang Q, Mu T, Chen K, Xiong S, Wang G. PLA2G16 Expression in Human Osteosarcoma Is Associated with Pulmonary Metastasis and Poor Prognosis. *PLoS One* 2015;**10**:e0127236

168. Li W, Zhang X, Xi X, Li Y, Quan H, Liu S, Wu L, Wu P, Lan W, Shao Y, Li H, Chen K, Hu Z. PLK2 modulation of enriched TAp73 affects osteogenic differentiation and prognosis in human osteosarcoma. *Cancer medicine* 2020;**9**:4371-85

169. Jiang H, Guo W, Yuan S, Song L. PLOD1 Is a Prognostic Biomarker and Mediator of Proliferation and Invasion in Osteosarcoma. *Biomed Res Int* 2020;**2020**:3418398

170. Cheng L, Wang C, Jing J. Polo-like kinase 1 as a potential therapeutic target for osteosarcoma. *Current pharmaceutical design* 2015;**21**:1347-50

171. Cho YJ, Kim SH, Kim EK, Han JW, Shin KH, Hu H, Kim KS, Choi YD, Kim S, Lee YH, Suh JS, Ahn JB, Chung HC, Noh SH, Rha SY, Jung ST, Kim HS. Prognostic implications of polycomb proteins ezh2, suz12, and eed1 and histone modification by H3K27me3 in sarcoma. *BMC cancer* 2018;**18**:158

172. Wang X, Wang D, Yuan N, Liu F, Wang F, Wang B, Zhou D. The prognostic value of PCNA expression in patients with osteosarcoma: A meta-analysis of 16 studies. *Medicine (Baltimore)* 2017;**96**:e8254

173. Zheng C, Tang F, Min L, Hornicek F, Duan Z, Tu C. PTEN in osteosarcoma: Recent advances and the therapeutic potential. *Biochim Biophys Acta Rev Cancer* 2020;**1874**:188405

174. Zhou J, Xiao X, Wang W, Luo Y. Association between PTEN and clinical-pathological features of osteosarcoma. *Bioscience reports* 2019;**39**

175. Yang H, Li Y, Peng Z, Wang Y. Overexpression of miR-20a promotes the progression of osteosarcoma by directly targeting QKI2. *Oncology letters* 2019;**18**:87-94

176. Ren W, Gu G. Prognostic implications of RB1 tumour suppressor gene alterations in the clinical outcome of human osteosarcoma: a meta-analysis. *Eur J Cancer Care (Engl)* 2017;**26**

177. Luo S, Zhao J, Fowdur M, Wang K, Jiang T, He M. Highly expressed ribosomal protein L34 indicates poor prognosis in osteosarcoma and its knockdown suppresses osteosarcoma proliferation probably through translational control. *Scientific reports* 2016;**6**:37690

178. Won KY, Park HR, Park YK. Prognostic implication of immunohistochemical Runx2 expression in osteosarcoma. *Tumori* 2009;**95**:311-6

179. Cao CM, Yang FX, Wang PL, Yang QX, Sun XR. Clinicopathologic significance of S100A4 expression in osteosarcoma. *Eur Rev Med Pharmacol Sci* 2014;**18**:833-9

180. Gao Y, Qu Y, Zhou Q, Ma Y. SIRT6 inhibits proliferation and invasion in osteosarcoma cells by targeting N-cadherin. *Oncology letters* 2019;**17**:1237-44

181. Li C, Yuan B, Yu X, Ju L, Ma Y, Guo D, Zhang K. SLC19A1 May Serve as a Potential Biomarker for Diagnosis and Prognosis in Osteosarcoma. *Clinical laboratory* 2020;**66**

182. Xu H, Liu T, Li W, Yao Q. SMAR1 attenuates the stemness of osteosarcoma cells via through suppressing ABCG2 transcriptional activity. *Environmental toxicology* 2021;**36**:1090-98

183. Li Z, Li H, Chen J, Luo H, Zeng J, Yao Y, Duan M. SPAG5 promotes osteosarcoma metastasis via activation of FOXM1/MMP2 axis. *The international journal of biochemistry & cell biology* 2020;**126**:105797

184. Liu Y, Liao S, Bennett S, Tang H, Song D, Wood D, Zhan X, Xu J. STAT3 and its targeting inhibitors in osteosarcoma. *Cell proliferation* 2021;**54**:e12974

185. Wu P, Wu D, Zhao L, Huang L, Shen G, Huang J, Chai Y. Prognostic role of STAT3 in solid tumors: a systematic review and meta-analysis. *Oncotarget* 2016;**7**:19863-83

186. Guo Z, Tang Y, Fu Y, Wang J. Decreased expression of STAT5A predicts poor prognosis in osteosarcoma. *Pathology, research and practice* 2019;**215**:519-24

187. Yu B, Zhang F, Liu L, Liang Y, Tang X, Peng Y, Cai F, Zeng D, Yuan X, Li J, Guo Y, Lv B, Wang M, Liao Q, Lv XB. The novel prognostic risk factor STC2 can regulate the occurrence and progression of osteosarcoma via the glycolytic pathway. *Biochemical and biophysical research communications* 2021;**554**:25-32

188. Liu Y, Teng Z, Wang Y, Gao P, Chen J. Prognostic Significance of Survivin Expression in Osteosarcoma Patients: A Meta-Analysis. *Medical science monitor : international medical journal of experimental and clinical research* 2015;**21**:2877-85

189. Ge W, Li J, Fan W, Xu D, Sun S. Tim-3 as a diagnostic and prognostic biomarker of osteosarcoma. *Tumour Biol* 2017;**39**:1010428317715643

190. Ru JY, Cong Y, Kang WB, Yu L, Guo T, Zhao JN. Polymorphisms in TP53 are associated with risk and survival of osteosarcoma in a Chinese population. *International journal of clinical and experimental pathology* 2015;**8**:3198-203

191. Wu H, Zhang J, Dai R, Xu J, Feng H. Transferrin receptor-1 and VEGF are prognostic factors for osteosarcoma. *Journal of orthopaedic surgery and research* 2019;**14**:296

192. Feng J, Lan R, Cai G, Lin J, Wang X, Lin J, Han D. Verification of TREX1 as a promising indicator of judging the prognosis of osteosarcoma. *Journal of orthopaedic surgery and research* 2016;**11**:150

193. Xi X, Bao Y, Zhou Y, Chen Y, Zhong X, Liao J, Zhou J, Xu S, Cao Z, Hu K, Hu Y, He X, Zhou L, Lin H, Wu Q. Oncogenic gene TRIM10 confers resistance to cisplatin in osteosarcoma cells and activates the NF-κB signaling pathway. *Cell biology international* 2021;**45**:74-82

194. Chen Y, Guo Y, Yang H, Shi G, Xu G, Shi J, Yin N, Chen D. TRIM66 overexpresssion contributes to osteosarcoma carcinogenesis and indicates poor survival outcome. *Oncotarget*

2015;**6**:23708-19

195. Li Z, Jia M, Wu X, Cui J, Pan A, Li L. Overexpression of Trps1 contributes to tumor angiogenesis and poor prognosis of human osteosarcoma. *Diagnostic pathology* 2015;**10**:167

196. Zhao GS, Gao ZR, Zhang Q, Tang XF, Lv YF, Zhang ZS, Zhang Y, Tan QL, Peng DB, Jiang DM, Guo QN. TSSC3 promotes autophagy via inactivating the Src-mediated PI3K/Akt/mTOR pathway to suppress tumorigenesis and metastasis in osteosarcoma, and predicts a favorable prognosis. *Journal of experimental & clinical cancer research : CR* 2018;**37**:188

197. Wang X, He H, Zhang K, Peng W. The expression of TSSC3 and its prognostic value in patients with osteosarcoma. *Biomedicine & pharmacotherapy = Biomedecine & pharmacotherapie* 2016;**79**:23-6

198. Wushou A, Hou J, Zhao YJ, Shao ZM. Twist-1 up-regulation in carcinoma correlates to poor survival. *International journal of molecular sciences* 2014;**15**:21621-30

199. Huang J, Zhu B, Lu L, Lian Z, Wang Y, Yang X, Satiroglu-Tufan NL, Liu J, Luo Z. The expression of novel gene URG4 in osteosarcoma: correlation with patients' prognosis. *Pathology* 2009;**41**:149-54

200. Li XD, Yu DD, Lu JR, Wu C, Jin WX. Effect of polymorphisms of vascular endothelial growth factor on prognosis in osteosarcoma patients. *Genet Mol Res* 2015;**14**:4354-60

201. Yu XW, Wu TY, Yi X, Ren WP, Zhou ZB, Sun YQ, Zhang CQ. Prognostic significance of VEGF expression in osteosarcoma: a meta-analysis. *Tumour Biol* 2014;**35**:155-60

202. Ługowska I, Woźniak W, Klepacka T, Michalak E, Szamotulska K. A prognostic evaluation of vascular endothelial growth factor in children and young adults with osteosarcoma. *Pediatr Blood Cancer* 2011;**57**:63-8

203. Liu JQ, Bai X, Duan DC, Dou AX. Role of five small nucleotide polymorphisms in the VEGF gene on the susceptibility to osteosarcoma and overall survival of patients. *Oncology letters* 2015;**10**:1481-86

204. Xie L, Ji T, Guo W. Anti-angiogenesis target therapy for advanced osteosarcoma (Review). *Oncol Rep* 2017;**38**:625-36

205. Liu JY, Zhu BR, Wang YD, Sun X. The efficacy and safety of Apatinib mesylate in the treatment of metastatic osteosarcoma patients who progressed after standard therapy and the VEGFR2 gene polymorphism analysis. *Int J Clin Oncol* 2020;**25**:1195-205

206. Kurucu N, Sahin G, Sari N, Ceylaner S, Ilhan IE. Association of vitamin D receptor gene polymorphisms with osteosarcoma risk and prognosis. *Journal of bone oncology* 2019;**14**:100208

207. Ren K, Yao N, Wang G, Tian L, Ma J, Shi X, Zhang L, Zhang J, Zhou X, Zhou G, Wu S, Sun X. Vasculogenic mimicry: a new prognostic sign of human osteosarcoma. *Human pathology* 2014;**45**:2120-9

208. Li L, Xu C, Liu P, Huang J. Correlation study of DNA methylation of WNT6 gene with osteosarcoma in children. *Oncology letters* 2017;**14**:271-75

209. Yang J, Cheng D, Zhou S, Zhu B, Hu T, Yang Q. Overexpression of X-Box Binding Protein 1 (XBP1) Correlates to Poor Prognosis and Up-Regulation of PI3K/mTOR in Human Osteosarcoma. *International journal of molecular sciences* 2015;**16**:28635-46

210. Biason P, Hattinger CM, Innocenti F, Talamini R, Alberghini M, Scotlandi K, Zanusso C, Serra M, Toffoli G. Nucleotide excision repair gene variants and association with survival in osteosarcoma patients treated with neoadjuvant chemotherapy. *The pharmacogenomics journal* 2012;**12**:476-83

211. Wang Y, Wang G, Dong Z. Association of X-ray cross-complementing group 3 Thr241Met gene

polymorphism with osteosarcoma risk and its development and prognosis. *J Cancer Res Ther* 2018;**14**:S1178-s82

212. Zhu B, Cheng D, Li S, Zhou S, Yang Q. High Expression of XRCC6 Promotes Human Osteosarcoma Cell Proliferation through the β-Catenin/Wnt Signaling Pathway and Is Associated with Poor Prognosis. *International journal of molecular sciences* 2016;**17**