**Supplementary Table 1. Summary of non-coding RNAs in sarcoma therapeutic resistance.**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| First authorYear[Reference] | Pathological type(subtype) | Setting | Non-coding RNA investigated | Intervention | Methods | Number of replicates/subjects | Genes and pathways | Major conclusion | W-MeQS |
| Chemotherapy (OS) |
| Xie2020[1] | OS | in vitro | lncRNA NORAD | cisplatin | RT-qPCR | 3 | miR-410-3p/NF-κB | Inhibition of lncRNA NORAD expression can increase sensitivity to cisplatin. | 4 |
| Li2019[2] | OS | in vitro | lncRNA ANRIL | cisplatin | RT-qPCR | 3 | miR-125a-5p/STAT3 | ANRIL knockdown sensitizes OS cells to cisplatin. | 3 |
| Lee2021[3] | OS | in vitro | lncRNA ANRIL | cisplatindoxorubicin | RT-qPCR | 3 | - | The over-expression of ANRIL in OS cells led to an increased resistance to both agents. | 5 |
| Wang2016[4] | OS | in vitro | LINC00161 | cisplatin | RT-qPCRmicroarray | 3 | miR-645/IFIT2 | LINC00161 sensitizes OS cells to cisplatin. | 7 |
| Zhang2021[5] | OS | in vitro | lncRNA FOXD2-AS1 | cisplatin | RT-PCR | - | miR-143/ (Bax&Bcl-2) | LncRNA FOXD2-AS1 knockdown inhibits the resistance of human OS cells to cisplatin. | 3 |
| Li2021[6] | OS | in vitro | LINC01116 | doxorubicin | RT-qPCR | 3 | miR-424-5p/HMAG2 | LINC01116 promotes doxorubicin resistance in OS. | 5 |
| Cheng2019[7] | OS | in vitro | lncRNA NCK-AS1 | cisplatin | RT-qPCR | 3 | miR-137/ (Bax, Bcl-2 &cleaved caspase 3) | NCK-AS1 knockdown enhanced DDP sensitivity of OS cells. | 4 |
| Zhang2017[8] | OS | in vitro | LINC00473 | cisplatin | RT-qPCR | 3 | C/EBPβ-IL24 | Elevated ZBTB7A inhibits cisplatin-induced apoptosis by repressing LINC00473 expression in OS cells. | 7 |
| Sun2022[9] | OS | in vitro | lncRNA SNHG15 | cisplatin | RT-qPCR | 3 | miR-335-3p/ZNF32 | SNHG15 suppresses cisplatin-induced apoptosis and ROS accumulation through the miR-335-3p/ZNF32 pathway. | 7 |
| Wang2021[10] | OS | in vitro | lncRNA DICER1-AS1 | cisplatincarboplatinetoposidemethotrexatedoxorubicin | RT-qPCR | 3 | miR-34a-5p/GADD45A | DICER1-AS1 indeed involves in the inhibition of the multi-drugresistance of OS cells. | 9 |
| Song2019[11] | OS | in vitroin vivo | lncRNA OIP5-AS1 | cisplatin | qPCR | 3 | miR-340-5p/ LPAATβ/PI3K/AKT/mTOR  | Lnc RNA OIP5AS1 causes cisplatin resistance in OS. | 6 |
| Han2018[12] | OS | in vitroin vivo | lncRNA LUCAT1 | methotrexate | RT-qPCR | 3 | miR-200c/ABCB1 | LUCAT1 knockdown decreased the expression levels drug resistance related genes. | 5 |
| Zhou2019[13] | OS | in vitroin vivo | lncRNA TUG1 | cisplatin | RT-qPCR | - | MET/AKT  | Knockdown of TUG1 inhibited the cisplatin resistance. | 4 |
| Hu2019[14] | OS | in vitroin vivo | lncRNA TUG1 | doxorubicin | RT-qPCR | - | AKT | Down-regulating of lncRNA TUG1 promotes apoptosis of doxorubicin resistant OS cells. | 7 |
| Sun2019[15] | OS | in vitroin vivo | lncRNA PVT1 | gemcitabine | RT-qPCR | 3 | miR-152/c-MET/PI3K/AKT | LncRNAPVT1 targets miR-152 to enhance chemoresistance of OS to gemcitabine. | 6 |
| Liu2021[16] | OS | in vitroin vivo | lnc MALAT-1 | doxorubicin | RT-qPCR | 3 | ERK | Downregulating MALAT-1 in the doxorubicin resistance OS cells could reverse the resistance and may improve chemotherapeutic efficiency. | 7 |
| Pu2021[17] | OS | in vitroin vivo | lncRNA LAMTOR5-AS1 | cisplatin | RT-qPCR | 3 | NRF2 | LAMTOR5-AS1 significantly inhibits the proliferation and drug resistance of OS cells. | 9 |
| Shen2020[18] | OS | in vitroin vivo | lnc ARSR | adriamycinpaclitaxelcisplatin | RT-qPCRmicroarray | 3 | MRP1 | The reduction of lnc ARSR overcame the resistance to adriamycin. | 9 |
| Wang2020[19] | OS(N/A) | in vitrohumans  | LINC00426 | doxorubicin | RT-qPCR | 3/OS tissues:50normal tissues:50 | miR-4319/caspase 3 | LINC00426 contributes to doxorubicin resistance. | 4 |
| Zhu2019[20] | OS(N/A) | in vitrohumans  | lncRNA MEG3 | doxorubicincisplatinmethotrexate | RT-qPCR | 3/chemo-sensitive OS tissue:48chemo-resistance OS tissue:32 | hsa-miR-200b-3p/AKT2 | LncRNA MEG3 could promote the OS doxorubicin resistance through miR-200b-3p/AKT2 axis. | 9 |
| hsa\_circ\_0001258 | hsa-miR-744-3p/GSTM | Hsa\_circ\_0001258 suppressed the doxorubicin resistance of OS cells through hsa-miR-744-3p /GSTM2 axis. |
| Fu2019[21] | OS(N/A) | in vitrohumans  | lncRNA TTN-AS1 | cisplatin | qPCR | -/OS tissues:55normal tissues:9 | miR-134-5p/MBTD1 | Downregulation of lncRNA TTN-AS1 reduced drug resistance. | 8 |
| Zhang2020[22] | OS(N/A) | in vitrohumans  | lncRNA MSC-AS1 | cisplatin | RT-qPCR | 3/OS tissues:45normal tissues:45 | miR-142/PI3K/AKT  | Slience MSC-AS1 made OS cells more sensitive to cisplatin. | 4 |
| Liu2020[23] | OS(N/A) | in vitroin vivohumans  | lncRNA OIP5-AS1 | cisplatin | RT-qPCR | 3/cisplatin-resistant OS tissue: 30cisplatin-sensitive OS tissue: 17  | miR-377-3p/FOSL2 | LncRNA OIP5-AS1 positively modulated FOSL2 expression to decrease cisplatin sensitivity in OS. | 6 |
| Gu2020[24] | OS(N/A) | in vitroin vivohumans  | LINC00922 | doxorubicin | RT-qPCRmicroarray | -/OS tissues:40normal tissues:40 | miR-424-5p/TFAP2C | LINC00922 accelerated OS doxorubicin-resistance. | 4 |
| Sun2020[25] | OS(N/A) | in vitroin vivohumans | lncRNA OIP5-AS1 | doxorubicin | RT-qPCR | 3/OS tissues:56normal tissues:16 | miR-137-3p/PTN | LncRNA OIP5-AS1 promotes resistance to doxorubicin by regulating miR-137-3p/PTN axis in OS. | 6 |
| Meng2020[26] | OS(osteoblastic/ chondroblastic/ fibroblastic/ mixed OS) | in vitroin vivohumans  | lncRNA MIR17HG | cisplatin | RT-qPCR | 3/OS tissues:40(15 osteoblastic, 10 chondroblastic, 9 fibroblastic and 6 mixed OS)normal tissues:40 | miR-130a-3p/SP1 | MIR17HG promoted theproliferation, invasion and cisplatin resistance of OS cells in vitro. | 5 |
| Liang2018[27] | OS(osteoblastoma/other OS) | in vitroin vivohumans  | lncRNA DNAJC3‐AS1 | cisplatin | RT-qPCR | 3/tumor tissues: 30(19 osteoblastoma and 11 other OS)normal tissues: 30 | DNAJC3 | DNAJC3‐AS1 reduced sensitivity of OS to cisplatin. | 7 |
| Shi2020[28] | OS(N/A) | in vitroin vivohumans  | lncRNA PWRN1 | cisplatin | RT-qPCR | -/OS tissues: 54normal tissues: 54 | miR-214-5p | PWRN1 overexpression inhibited cisplatin chemoresistance in OS cells. | 4 |
| Zhu2020[29] | OS(N/A) | in vitroin vivohumans  | lncRNA Sox2OT-V7 | doxorubicin | RT-qPCR | 3/OS tissues: 32normal tissues: 32 | miR-142/miR-22 | Sox2OT-V7 promotes doxorubicin-induced chemoresistance in OS. | 8 |
| Wen2020[30] | OS(N/A) | in vitroin vivohumans  | lncRNA-SARCC | cisplatin | RT-qPCR | 3/cisplatin-sensitive OS tissue:20cisplatin-resistant OS tissue:20 | miR-143/Hexokinase 2 | LncRNA-SARCC sensitizes OS to cisplatin. | 4 |
| Wang2017[31] | OS(N/A) | in vitroin vivohumans  | lncRNA CTA | doxorubicin | RT-qPCR | 3/OS tissues: 30normal tissues: 30 | miR-210/ (p62, cleaved caspase 3& Bcl-2) | LncRNA CTA sensitizes OS cells to doxorubicin. | 6 |
| Guo2020[32] | OS(N/A) | in vitrohumans  | lncRNA HOTAIR | cisplatin | qPCR | 3/sensitive cases:20 resistant cases:20 | miR-106a-5p/STAT3 | HOTAIR enhanced cisplatin resistance of OS. | 5 |
| Zhou2018[33] | OS(N/A) | in vitrohumans  | lncRNA SNHG12 | doxorubicin | RT-qPCR | 3/sensitive cases:32 resistant cases:32 | miR-320a/MCL1 | Knockdown of SNHG12 improved the sensitivity of doxorubicin. | 5 |
| Zhang2016[34] | OS(N/A) | in vitrohumans  | lncRNA ODRUL | doxorubicin | RT-qPCR | -/sensitive cases:30 resistant cases:30 | ABCB1 | LncRNA ODRUL contributes to doxorubicin resistance of OS. | 5 |
| Cheng2019[35] | OS(N/A) | in vitrohumans  | lncRNA ROR | cisplatin | RT-qPCR | 3/primary OS tissues: 25relapsed OS tissues: 25 | miR-153-3p/ABCB1 | LncRNA ROR induce cisplatin resistance in OS. | 3 |
| Zhang2017[36] | OS(N/A) | in vitroin vivohumans  | lncRNA FOXC2-AS1 | doxorubicin | RT-qPCR | -/chemosensitive OS tissue: 34chemoresistant OS group: 34 | FOXC2/ABCB1 | LncRNA FOXC2-AS1 promotes doxorubicin resistance in OS | 6 |
| Zhu2019[37] | OS(N/A) | in vitroin vivohumans  | lncRNA OIP5‐AS1 | doxorubicin | RT-qPCR | -/chemo‐resistant:32chemo‐sensitive:48 | miR-200b-3p/Fibronectin‐1 | Lnc RNA OIP5‐AS1 modulates Fibronectin‐1 contributes to doxorubicin resistance of OS cells. | 8 |
| Li2018[38] | OS(N/A) | in vitrohumans  | lncRNA B4GALT1-AS1 | adriamycin | RT-qPCR | 3/tumor sample:39normal tissue:39 | YAP | Knockdown of B4GALT1-AS1 inhibited OS cells chemotherapeutic sensitivity. | 7 |
| Hu2018[39] | OS(N/A) | in vitroin vivohumans  | lncRNA NEAT1 | cisplatin | RT–qPCR | -/OS tissue:40normal tissue:20 | miR-34c/ (Bcl-2, CCND1) | Knockdown of lncRNA NEAT1 improves the sensitivity to cisplatin in OS. | 6 |
| Li2016[40] | OS(N/A) | in vitrohumans  | lnc HOTTIP | cisplatin | RT-qPCR | 3/OS tissue:21normal tissue:21 | Wnt/β-catenin  | Overexpression of lnc HOTTIP increases chemoresistance of OS. | 3 |
| Chen2018[41] | OS(osteoblastoma/other OS) | in vitroin vivohumans  | lnc RAB11B-AS1 | cisplatin | RT-qPCR | 3/OS tissue: 24(14 osteoblastoma and 10 other OS)normal tissue:24 | RAB11B | The reduction of RAB11B-AS1 results in lower sensitivity to cisplatin in OS cells. | 7 |
| Zhu2017[42] | OS(N/A) | in vitroin vivohumans  | lncRNA FENDRR | doxorubicin | RT-qPCR | 3/chemoresistant group:40chemosensitive group:40 | ABCB1ABCC1 | LncRNA FENDRR sensitizes doxorubicin-resistance of OS cells. | 5 |
| Zhang2020[43] | OS(N/A) | in vitroin vivohumans  | lncRNA SNHG15 | doxorubicin | RT-qPCR | 3/chemoresistant group:30chemosensitive group:30 | miR-381-3p/GFRA1 | LncRNA SNHG15 contributes to doxorubicin resistance of OS cells. | 4 |
| Tang2022[44] | OS(N/A) | in vitroin vivohumans | LINC00641 | cisplatin | RT-qPCR | OS tissues and paracancerous tissues:58 pairs | miR-320d/MCL1 | Knock-down of LINC00641 gene represses DDP-resistance of DDP-resistant OS cells via modulating miR-320d. | 5 |
| Liu2020[45] | OS | in vitro | miR-187 | doxorubicin | RT-qPCR | 3 | MAPK7 | MiR-187 enhanced the chemosensitivity of the OS cells to doxorubicin | 3 |
| Patil2019[46] | OS | in vitro | miR-509-3p | cisplatin | RT-qPCR | 3  | AXLARHGAP1 | MicroRNA-509-3p sensitizes OS to cisplatin. | 8 |
| Wang2020[47] | OS | in vitro | miR-410-3p | cisplatin | RT-qPCR | 3 | HMGB1/NF-κB | Overexpression of miR-410-3p increased cisplatin sensitivity of OS cells via suppressing HMGB1/NF-κB pathway. | 4 |
| Lou2019[48] | OS | in vitro | miR-29b | doxorubicin | RT-qPCR | 3 | MMP-9 | MiR-29b sensitizes OS cells to doxorubicin. | 3 |
| Li2020[49] | OS | in vitro | miR-29b | doxorubicin | RT-qPCR | 3 | spin1/PI3K/AKTspin1/STAT3  | Down-regulating of miR-29b promotes OS cell drug resistance. | 8 |
| Vanas2016[50] | OS | in vitro | miR-21 | cisplatin | northern blot | 3 | Spry2 | MiRNA-21 increases cisplatin sensitivity of OS-derived cells | 5 |
| Ziyan2014[51] | OS | in vitro | miR-21 | cisplatin | RT-qPCR | 3 | Bcl-2 | Suppression of miR-21 in OS cells led to enhanced cisplatin cytotoxicity. | 3 |
| Bazavar2020[52] | OS | in vitro | miR-192 | methotrexate | RT-qPCR | 4 | MMP-9c-MycKRASCXCR-4ADAMTS | MiR-192 enhances sensitivity of methotrexate to OS cells. | 3 |
| Xu2016[53] | OS | in vitro | miR-30a | doxorubicin | RT-qPCR | 3 | Beclin-1 | MicroRNA-30a downregulation contributes to chemoresistance of OS cell. | 4 |
| Wang2019[54] | OS | in vitro | miR-22 | cisplatin | RT-qPCR | 3 | MTDH | MiR-22 sensitized OS cells to cisplatin treatment. | 4 |
| Li2014[55] | OS | in vitro | miR-22 | doxorubicincisplatin | RT-qPCR | 3 | HMGB1 | Overexpressed miR-22 against chemotherapy resistance in OS. | 4 |
| Zhu2020[56] | OS | in vitro | miR-4779 | doxorubicin | - | - | PLK1 | MiR-4779 negatively regulatesthe expression of PLK1 and possesses a cancer-inhibiting role in drug-resistant OS cells. | 3 |
| Zhang2015[57] | OS | in vitro | miR-217 | cisplatin | RT-qPCR | 3 | KRAS | Overexpression of miR-217 enhanced cisplatin sensitivity of 143B OS cells. | 6 |
| Song2017[58] | OS | in vitro | miR-340-5p | cisplatin | RT-qPCR | 2 | LPAATβ | MiR-340-5p enhanced the sensitivity to CDDP. | 3 |
| Song2017[59] | OS | in vitro | miR-214 | cisplatin | RT-qPCR | 3 | HK2PKM2LDHA | MiR-214 contributes to cisplatin resistance in OS cells. | 3 |
| Fiore2016[60] | OS | in vitro | Let-7d microRNA | doxorubicincisplatinpaclitaxeletoposide | RT-qPCR | 4 | Bcl-2caspase3E2F2CCND2 | Let-7d- overexpression reduced cell sensitivity to apoptosis induced by various chemotherapy drugs. | 6 |
| Zhang2015[61] | OS | in vitro | miR-301a | doxorubicin | RT-qPCRnorthern blot | 3 | AMPKα1 | Up-regulation of miR-301a contributed to chemoresistance of OS cells. | 6 |
| Meng2020[62] | OS | in vitroin vivo | miR-22 | cisplatin | RT-qPCR | 3 | MTDH | MiR-22 promoted cisplatin sensitivity. | 4 |
| Meng2020[63] | OS | in vitroin vivo | miR‑22 | cisplatin | RT‑qPCR | 3 | PI3K/AKT/mTOR | MiR‑22 leads to an improvement in the sensitivity of cisplatin in OS. | 7 |
| Yuan2018[64] | OS | in vitroin vivo | miR-20a | doxorubicincisplatin | RT-qPCR | 3 | TAK1 | Overexpression of miR-20a sensitizes the OS cells to chemotherapeutic drugs. | 5 |
| Lin2016[65] | OS | in vitroin vivo | miR-184 | doxorubicin | RT-qPCR | 3 | BCL2L1 | MiR-184 leads to poor response to doxorubicin therapy. | 4 |
| Lei2018[66] | OS | in vitroin vivo | miR-199a-3p | cisplatincarboplatindoxorubicin  | RT-qPCR | 3 | AK4/NF-кB | MiR-199a-3p promoted multi-drug resistance in OS cells. | 6 |
| Pu2016[67] | OS | in vitroin vivo | miR-34a-5p | doxorubicinetoposidemethotrexatecisplatincarboplatin | RT-qPCR | 3 | MEF2  | MiR-34a-5p promotes multi-drug resistance in OS cells. | 7 |
| Song2010[68] | OS  | in vitro | miR-215 | methotrexate | RT–qPCR | 2 | DTL | MiR-215 increase in chemoresistance to methotrexate in OS cells. | 7 |
| Li2017[69] | OS | in vitro, | miR-34a | cisplatin | RT–qPCR | 3 | c-MycBim | MiR-34a increases cisplatin sensitivity of OS cells in vitro. | 4 |
| Zhou2016[70] | OS | in vitro | miR-34b | doxorubicingemcitabinemethotrexate | RT-qPCR | 3 | ABCB1PAK1 | miR-34b overexpression reverses multidrug resistance in human OS cells in vitro. | 6 |
| Chang2014[71] | OS | in vitro | miR-101 | doxorubicin | - | 3 | LC3-ⅠLC3-Ⅱ | Blocked autophagy by miR-101 enhances OS cell chemosensitivity. | 3 |
| Gao2015[72] | OS | in vitro | miR-199a-3p | doxorubicin | microarray  | 3 | CD44 | MiR-199a-3p transfection increased drug sensitivity in OS. | 7 |
| Fiore2014[73] | OS | in vitro | miR‐29b-1 | cisplatindoxorubicinetoposide | RT-qPCR | 3 | Oct3/4SOX2NanogCD133N-Myc | MiR-29b-1 overexpression sensitized OS cells to chemotherapeutic drug-induced apoptosis. | 4 |
| Wei2016[74] | OS | in vitro | miR-140-5p | cisplatindoxorubicin | RT-qPCR | 3 | IP3K2 | The increased miR-140-5p expression levels up-regulated anticancer drug-induced autophagy in OS cells. | 3 |
| Xie2018[75] | OS | in vitro | miR-149 | doxorubicin | RT-qPCR | 3/tumor tissue:41normal tissue:36 | BMP9 | Overexpression of miR-149 conferred chemoresistance in OS cells. | 4 |
| Novello2014[76] | OS | in vitro | miR-34a | etoposide | RT-qPCR | 3 | - | MiR-34a basal levels were lower in p53-deficient OS cells and with a higher sensitivity to etoposide. | 5 |
| Chen2014[77] | OS | in vitro | miR-155 | cisplatin | qPCR | 3 | LC3-ⅠLC3-Ⅱ | The increased miR-155 expression levels upregulated anti­cancer drug-induced autophagy in OS cells. | 3 |
| Li2015[78] | OS | in vitro | miR-199a-5p | cisplatin | RT-qPCR | 3 | LC3-ⅠLC3-Ⅱ | MicroRNA-199a-5p inhibits cisplatin-induced drug resistance in OS cells. | 3 |
| Huang2021[79] | OS | in vitro | miR-203 | cisplatin | RT-qPCR | 3 | RUNX2 | Knockdown of microRNA-203 reduces cisplatin chemosensitivity to OS cell lines. | 4 |
| Zou2018[80] | OS | in vitro | miR-133b | cisplatin | RT-qPCR | 3 | - | MiR-133b induces chemoresistance of OS cells to cisplatin treatment. | 3 |
| Zhu2021[81] | OS | in vitro | miR-128-3p | cisplatin | RT-qPCR | 3 | ZC3H12D | MiR-128-3p overexpression also improved resistance to cisplatin in OS cells. | 4 |
| Zhang2019[82] | OS | in vitro | miR-19a-3p | cisplatin | RT-qPCR | 3 | PTEN | Silencing of miR‑19a‑3p enhances OS cells chemosensitivity. | 5 |
| Jiang2015[83] | OS | in vitro | miR-126 | cisplatinmethotrexate | qPCR | - | - | MicroRNA-126 enhances the sensitivity of OS cells to cisplatin and methotrexate. | 5 |
| Chen2016[84] | OS | in vitro | miR-34amiR-203 | cisplatin | RT-qPCR | 3 | survivin | MiR-34a and miR-203 enhanced cell sensitivity to cisplatin. | 7 |
| Yu2019[85] | OS | in vitro | miR-26a-5p | paclitaxel | RT-qPCR | 3 | HOXA5 | Knock-down of miR-26a-5p increased OS cell sensitivity to chemotherapeutic drug paclitaxel. | 3 |
| Pu2017[86] | OS | in vitroin vivo | miR-34a-5p | doxorubicinetoposidemethotrexatecisplatin | RT-qPCR | 3 | DLL1 | MiR-34a-5p promotes multi-chemoresistance of OS. | 4 |
| Song2009[87] | OS | in vitroin vivo | miR-140 | methotrexate | RT–qPCR | 2 | HDAC4 | Overexpression of miR-140 causes chemoresistance to methotrexate in OS. | 7 |
| Pu2017[88] | OS | in vitroin vivo | miR-34a-5p | doxorubicin cisplatincarboplatinetoposide | RT-qPCR | 3 | AGTR1 | The miR-34a-5p promotes the multi-chemoresistance of OS. | 6 |
| Osaki2016[89] | OS | in vitroin vivo | miR‐29 | cisplatindoxorubicin; | RT-qPCR | 3  | MCL1 | Upregulation of miR-29 enhanced chemotherapy- induced apoptosis in OS cells. | 6 |
| Zhang2021[90] | OS | in vitroin vivo | miR-134 | doxorubicin | RT-qPCR | 3/resistant group:23sensitive group:23 | PTBP1  | Downregulation of miR-134 promoted chemoresistance of OS cells to doxorubicin by upregulating PTBP1 expression. | 6 |
| Zhao2017[91] | OS | in vitroin vivo | miR‑20a‑5p | etoposidemethotrexatecisplatindoxorubicin | RT-qPCR | 3 | SDC2 | MiR‑20a‑5p represses the multi‑drug resistance of OS. | 5 |
| Wang2019[92] | OS | in vitroin vivo | miR-193a | doxorubicin | RT-qPCR | 3 | IRS2 | MiR-193a-3p suppresses both growth and doxorubicin drug resistance of OS in vivo. | 4 |
| Gao2017[93] | OS | in vitroin vivo | miR-335 | cisplatin | RT-qPCR | 3 | POU5F1 | Pre-miR-335 resulted in tumor enhanced sensitivity to traditional chemotherapy. | 6 |
| Cheng2020[94] | OS(N/A) | in vitroin vivohumans | miR‑487b‑3p | doxorubicin | RT-qPCR | -/patients:40 healthy bone:24 | ALDH1A3 | MiR‑487b‑3p inhibits OS chemoresistance. | 6 |
| Yu2019[95] | OS(N/A) | in vitrohumans  | miR-221 | cisplatin | RT-qPCR | 3/OS tissues:15normal tissues:15 | PPP2R2A | Overexpression of miR-221 promoted OS cell cisplatin resistance. | 5 |
| Tsai2018[96] | OS(N/A) | in vitroin vivohumans  | miR‐519d | doxorubicin | RT-qPCR | - | ABCG2 | Downregulation of miR‐519d increases ABCG2 expression and promotes drug resistance. | 6 |
| Meng2017[97] | OS(N/A) | in vitroin vivohumans  | miR-140-5p | cisplatindoxorubicinmethotrexate | RT-qPCRmicroarray | 3/OS tissues: 40normal tissues: 40 | HMGN5 | Knockdown of miR-140-5p enhanced OS cells resistance to multiple chemotherapeutics. | 8 |
| Zhang2020[98] | OS(N/A) | in vitrohumans  | miR-129-5p | 5-flurouracil | RT-qPCR | -/OS tissues: 30normal tissues: 30 | LARP1 | Down-regulation of miR-129-5p promoted proliferation, invasion, and drug resistance in OS. | 3 |
| Liu2019[99] | OS(N/A) | in vitrohumans  | miR-16 | cisplatin | RT-qPCR | 3/OS tissues: 30normal tissues: 30 | ATG4B | Down-regulation of miR-16 enhances cisplatin resistance of OS. | 5 |
| Keremu2019[100] | OS(N/A) | in vitroin vivohumans  | miR-199a | cisplatin | RT-qPCR | 3/OS tissues: 20normal tissues: 20 | HIF-1α | Overexpression ofmiR-199a resensitizes cisplatin resistant cells to cisplatin. | 5 |
| Yan2018[101] | OS(N/A) | in vitrohumans  | miR-340 | cisplatin | RT-qPCR | -/tumor tissues: 20normal tissues: 20 | ZEB1 | Overexpression of miR-340 enhanced sensitivity to DDP in OS cells. | 4 |
| Xiao2017[102] | OS(N/A) | in vitrohumans  | miR-100 | doxorubicin | RT-qPCR | 5/tumor tissues: 28normal tissues: 28 | ZNRF2 | MiR-100 suppresses OS cell chemoresistance | 3 |
| Wang2017[103] | OS(osteoblastic/ chondroblastic/ fibroblastic/ telangiectatic/ other OS) | in vitroin vivohumans  | miR-491 | cisplatin | RT-qPCR | -/OS patients:102(60 osteoblastic, 13 chondroblastic, 18 fibroblastic, 6 telangiectatic and 5 other OS)healthy control:20 | CRYAB | MiR-491 inhibits OS lung metastasis and chemoresistance | 8 |
| Zhou2018[104] | OS(parosteal/ conventional/ chondroblastic/osteoblastoma/telangiectatic OS) | in vitrohumans  | miR-22 | cisplatin | RT-qPCR | 3/OS patients:7(1 parosteal, 3 conventional,1 chondroblastic, 1 osteoblastoma and 1 telangiectatic OS)healthy control:7 | S100A11 | MiR-22 increase the cisplatin sensitivity of OS cells. | 4 |
| Zhang2020[105] | OS(N/A) | in vitroin vivohumans  | miR-429 | adriamycin | qPCR | 2/OS tissues:10normal tissues:10 | SOX2 | Upregulation of miR-429 increased adriamycin sensitivity through down regulating SOX2 in CD133+ OSCs. | 3 |
| Xu2014[106] | OS(N/A) | in vitrohumans  | miR-34c | cisplatindoxorubicinmethotrexate | RT-qPCR | 3/metastasis:25chemosensitive:76chemoresistance:21 | Notch1LEF1 | MiR-34c inhibits OS chemoresistance.  | 5 |
| Duan2016[107] | OS(N/A) | in vitroin vivohumans  | miR-15b | doxorubicin | RT-qPCRmicroarray | 4/samples from survivors; 14samples from nonsurvivors:35 | Wee1  | MDR in OS is associated with downregulation of miR-15b. | 9 |
| Maximov2019[108] | OS(osteoblatic/osteoblatic/chondroblastic/high-grade surface OS) | in vitroin vivohumans  | miR-16-1-3pmiR-16-2-3p | cisplatindoxorubicin | RT-qPCR | 3/OS samples:18(15 osteoblatic, 2 osteoblatic/chondroblastic and 1 high-grade surface OS ) | FGFR2 | MiR-16-1-3p and miR-16-2-3p overexpression enhances chemosensitivity. | 8 |
| Chen2017[109] | OS(N/A) | in vitrohumans  | miR-410 | cisplatin | RT-qPCR | 3/OS sample:40normal tissue:40 | ATG16L1 | MiR-410 enhances chemosensitivity in OS. | 5 |
| Lin2015[110] | OS(osteoblastic/ fibroblastic OS) | in vitrohumans  | miR‑202 | doxorubicin | RT-qPCR | 3/OS sample:8(6 osteoblastic and 2 fibroblastic OS)normal tissue:8 | TGF-β 1 | MiR-202 promotes chemotherapy resistance in OS cells. | 6 |
| Zhao2013[111] | OS(N/A) | in vitrohumans  | miR-221 | cisplatin | RT-qPCR | 3/OS tissue:60normal tissue:25 | PI3K/AKT | MicroRNA-221 Induces cisplatin resistance in human OS. | 5 |
| Zhou2016[112] | OS(N/A) | in vitrohumans  | miR-488 | doxorubicin | RT-qPCR | 3/OS tissue:5normal tissue:5 | Bim | Over-expression of miR-488 decreases the sensitivity to doxorubicin of OS cells. | 6 |
| Wang2021[113] | OS(N/A) | in vitrohumans  | miR-376c | cisplatin | RT-qPCR | 3/tumor tissue:26normal tissue:26 | TGFA | Cisplatin inhibited the prolif­eration of OS cells by upregulating miR-376c and downregulating *TGFA* expression. | 3 |
| Yang2020[114] | OS(N/A) | in vitroin vivohumans  | miR-216b | cisplatin | RT-qPCR | 3/OS tissue:60normal tissue:60 | JMJD2C//HIF-1α/HES1  | MiR-216b enhances cisplatin-induced apoptosis in OS cells | 9 |
| Xu2018[115] | OS(N/A) | in vitrohumans  | miR-29 | methotrexate | RT-qPCR | 3/poor-response:18good-response:18 | COL3A1MCL1 | MiR-29 inhibits resistance to methotrexate in OS. | 6 |
| Zhou2015[116] | OS(N/A) | in vitroin vivohumans  | miR-143 | doxorubicin | RT–qPCR | -/OS patients:45health controls:13 | ATG2BLC3-IBcl-2 | MiR-143 expression significantly reversed chemoresistance in OS resistance cells. | 6 |
| Liu2015[117] | OS(N/A) | in vitrohumans  | miR-100 | cisplatin | RT–qPCR | 3/OS sample:20normal sample:20 | IGFIR/PI3K/AKTIGFIR/MAPK/ERK  | MiR-100 enhances chemosensitivity in OS cells. | 4 |
| Shao2015[118] | OS(N/A) | in vitroin vivohumans  | miR-497 | cisplatin | RT–qPCR | 3/OS tissue:14normal tissue:14 | PI3K/AKT | The down regulation of miR-497 contributes to cisplatin resistance in OS. | 5 |
| Xu2016[119] | OS(N/A) | in vitrohumans  | miR-146b-5p | doxorubicincisplatinmethotrexate | RT-qPCR | 3/OS tissues:35normal tissue;35 | zinc and ring finger 3 | MiR-146b-5p promotes invasion and metastasis contributing to chemoresistance in OS. | 5 |
| Zhou2014[120] | OS(N/A) | in vitrohumans  | miR-33a | cisplatin | RT-qPCR | 2/poor responder:35good responder:35; | TWIST | MiR-33a promotes OS cell resistance to cisplatin. | 7 |
| Liu2019[121] | OS(N/A) | in vitrohumans  | miR-342-5p | doxorubicin | RT-qPCR | 3/OS tissues:6normal tissues:6 | Wnt/β-catenin | MiR-342-5p inhibits OS cell growth, migration, invasion, and sensitivity to doxorubicin. | 6 |
| Liu2018[122] | OS(N/A) | in vitroin vivohumans  | miR-92a | cisplatin | RT-qPCR | 3/tumor tissue;25nontumor tissue:25 | Notch1 | MiR-92a inhibits the progress of OS cells and increases the cisplatin sensitivity. | 4 |
| Li2021 [123] | OS(N/A) | in vitrohumans  | miR-329-3p | cisplatin | RT-qPCR | 3/tumor tissue: 30normal tissue:30 | LDHA  | Overexpression of miR-329-3p sensitizes OS cells to cisplatin. | 4 |
| Tang2018[124] | OS(N/A) | in vitrohumans  | miR-223 | cisplatin | RT-qPCR | 3/OS tissue: 20normal tissue:20 | JNK/JUN | MiR-223 overexpression further promoted CDDP-induced OS cell apoptosis. | 5 |
| Xu2014[125] | OS(osteoblastic/ chondroblastic/ fibroblastic/ telangiectatic/other OS) | in vitroin vivohumans  | miR-382 | cisplatindoxorubicinmethotrexate | RT-qPCR | 3/OS tissues:115(29 osteoblastic, 6 chondroblastic, 11 fibroblastic, 3 telangiectatic and 2 other OS)normal bone:107 | KLF12HIPK3 | MiR-382 inhibits tumor growth and enhance chemosensitivity in OS. | 4 |
| Liu2018[126] | OS(N/A) | in vitrohumans  | miR-377 | cisplatin | RT-qPCR | 3/poor responder:21good responder:21 | XIAP | Down-regulation of miR-377 contributes to cisplatin resistance in OS. | 4 |
| Liu2017[127] | OS(N/A) | in vitroin vivohumans  | miR-200c | cisplatin | RT-qPCR | 3/OS tissue:35normal tissue:35 | AKT2 | Overexpression of miR-200c increases chemosensitivity of OS cells to cisplatin. | 7 |
| Zhu2016[128] | OS(N/A) | in vitrohumans  | miR-138 | cisplatin | RT-qPCR | 3/OS tissue:20normal tissue:20 | EZH2 | MiR-138 enhances cisplatin-induced apoptosis in OS cells. | 7 |
| Long2018[129] | OS(N/A) | in vitrohumans  | miR‐590 | doxorubicin | qPCR | 3/OS tissue:18normal tissue:18 | WIP1/ATM-p53 | MiR‐590 overexpression could enhance the cytotoxicity of doxorubicin. | 5 |
| Li2016[130] | OS(N/A) | in vitrohumans  | miR-381 | cisplatin | RT-qPCR | 3/OS patients: 60chondroma patients:7 | mTOR | Low expression of miR-381 enhances the chemosensitivity of OS. | 6 |
| Wang2016[131] | OS(N/A) | in vitrohumans  | miR-367 | adriamycin | RT-qPCR | 3/tumor tissue:40normal tissue:40 | KLF4 | MiR-367 negatively regulates apoptosis induced by adriamycin in OS cells. | 4 |
| Li2021[132] | OS(N/A) | in vitroin vivohumans  | miR-26a | doxorubicinmethotrexatecisplatin | RT-qPCR | 5/chemoresistant group:12chemosensitive group:9; | MCL1 | MiR-26a reverses resistanceto doxorubicin in OS multidrug resistance cells. | 7 |
| Jin2017[133] | OS(conventional/ non-conventional OS) | in vitrohumans  | miR-610 | cisplatin | RT-qPCR | -/tumor tissue:21(13 conventional and 17 non-conventional OS)normal tissue:21; | TWIST1 | Overexpression of miR-610 increased sensitivity of OS cells to cisplatin. | 4 |
| Li2020[134] | OS(osteoblastic/ fibroblastic/ chondroblastic/telangiectatic OS) | in vitrohumans  | miR-584 | cisplatin | RT-qPCR | 3/OS tissue:37(19 osteoblastic, 8 fibroblastic, 6 chondroblastic and 4 telangiectatic OS)normal tissue:37; | CCN2/IκBα/NF-κB | MicroRNA-584 sensitizes OS cells to cisplatin. | 8 |
| Chen2019[135] | OS(N/A) | in vitrohumans  | miR-504 | cisplatin | RT-qPCR | 3/OS tissue:10normal tissue:10; | p53 | MiR-504 contributes to cisplatin resistance in OS cells. | 4 |
| Zhou2018[136] | OS(osteoblastic/ chondroblastic fibroblastic OS) | in vitrohumans  | miR‑192‑5p | cisplatin | RT-qPCR | 3/OS tissue:25(13 osteoblastic, 9 chondroblastic, and 3 fibroblastic OS)normal tissue:25; | USP1 | Ectopic expression of miR-192-5p increased the sensitivity of osteosarcoma cells to cisplatin. | 4 |
| Ling2020[137] | OS(N/A) | in vitrohumans  | miR-150 | doxorubicin | RT-qPCR | 3/OS tissue: 26normal tissue:26; | RUNX2 | MicroRNA-150 functions as a tumor suppressor and sensitizes OS to doxorubicin-induced apoptosis. | 4 |
| Sun2016[138] | OS(N/A) | in vitrohumans  | miR-24 | doxorubicin | RT-qPCR | 3/OS tissue: 45normal tissue:45; | BIM-Smac/DIABLO | Knockdown of miR-24 reverses the doxorubicin-resistance in OS cells. | 5 |
| Zhi2022[139] | OS(N/A) | in vitrohumans | miR-140 | doxorubicin | RT-qPCR | 3/OS tissues:50normal tissues:50 | Wnt1 | Overexpression of miR-140 inhibits OS cell proliferation and enhances drug sensitivity by suppressing Wnt1. | 5 |
| Zhou2021[140] | OS(N/A) | in vitrohumans | miR-141-3p | cisplatin | RT-qPCR | 3/OS and adjacent normal tissues:31 pairs | glutaminase | MiR-141-3p promotes the cisplatin sensitivity of OS cell through suppressing the glutaminase-mediated glutamine metabolism. | 4 |
| Liang2019[141] | OS(N/A) | in vitroin vivohumans  | miR-765 | cisplatin | RT-qPCR | 3/negative: 19positive: 24 | APE1 | MicroRNA-765 sensitizes OS cells to cisplatin. | 6 |
| Gao2020[142] | OS(N/A) | in vitroin vivohumans  | miR-375 | cisplatin | RT-qPCR | 3/chemosensitive group: 35chemoresistant group: 35 | ATG2B | MiR-375 suppresses autophagy and tumorigenesis in cisplatin-resistant OS cells | 5 |
| Wang2021[143] | OS(N/A) | in vitroin vivohumans | miR‐519d‐3p | cisplatin | RT-qPCR | OS and adjacent normal tissues:40 pairs | PD‐L1 | MiR‐519d‐3p antagonizes OS resistanceagainst cisplatin by targeting PD‐L1. | 8 |
| Wang2022[144] | OS(N/A) | in vitroin vivohumans | miR-19a-3p | cisplatin | RT-PCR | OS tissues:85 | PHLDA3/AKT/GSK3β | MiR-19a-3p promotes tumor growth and chemoresistance in OS by downregulating PHLDA3. | 5 |
| Zhan2022[145] | OS | in vitroin vivo | miR-579-3p | cisplatin | RT-qPCR | 3 | MSH6 | Increasing expressionof miR-579 could inhibit the development and cisplatin resistance of OS. | 7 |
| Zhang2021[146] | OS | in vitro | circ-CHI3L1.2 | cisplatin | RT-qPCR | 3 | miR-340-5p/LPAATβ | Circ-CHI3L1.2 knockdown sensitized cisplatin-resistant OS cells to cisplatin. | 7 |
| Zhang2020[147] | OS | in vitroin vivo | circTADA2A | cisplatin | RT-qPCR | 3 | miR-129-5p/(TRPS1, YAP1) | CircTADA2A knockdown inhibited cell proliferation and reduced cisplatin resistance in OS cells. | 7 |
| Feng2021[148] | OS | in vitroin vivo | circPRKAR1B | cisplatin | RT-qPCR | 3 | miR-361-3p/FZD4/ Wnt/β-catenin | Overexpression of circPRKAR1B suppresses the sensitivity of OS cells to cisplatin. | 8 |
| Dong2020[149] | OS(N/A) | in vitrohumans  | circUBAP2 | cisplatin | RT-qPCR | -/cisplatin-response:30cisplatin-resistance:30 | miR-506-3p/SEMA6D/Wnt/β-catenin  | CircUBAP2 promotes SEMA6D expression to enhance the cisplatin resistance in OS. | 6 |
| Wei2021[150] | OS(N/A) | in vitroin vivohumans  | circ\_0081001 | methotrexate | RT-qPCR | 3/sensitive group:35resistant group:28 | miR-494-3p/TGM2 | Circ\_0081001 knockdown enhances methotrexate sensitivity in OS cells. | 4 |
| Hu2019[151] | OS(chondroblastic/osteoblastic/ conventional/ telangiectatic OS) | in vitrohumans  | circ‐LARP4 | cisplatindoxorubicin | RT-qPCR | -/OS tissue:72(10 chondroblastic, 47 osteoblastic,9 conventional and 6 telangiectatic OS)normal tissue: 72 | miR-424 | Circ‐LARP4 elevates chemosensitivity to cisplatin and doxorubicin. | 5 |
| Li2020[152] | OS(N/A) | in vitroin vivohumans  | hsa\_circ\_0000073 | methotrexate | RT-qPCR | -/tumor tissues: 25normal tissues: 25; | (miR-145-5P, miR-151-3p)/NRAS | Hsa\_circ\_0000073 contributes to OS methotrexate resistance. | 7 |
| Li2021[153] | OS(N/A) | in vitroin vivohumans  | circPTV1 | doxorubicin | RT-qPCR | 3/chemoresistant group:21chemosensitive group:31 | miR-137/TRIAP1 | CircPVT1 contributes to doxorubicin resistance of OS cells. | 5 |
| Zhu2018[154] | OS(N/A) | in vitrohumans  | circPVT1 | doxorubicincisplatin | RT–qPCR | 3/OS patients: 80benign bone tumor:20healthy control:20 | ABCB1 | Overexpressed circPVT1 contributes to doxorubicin and cisplatin resistance of OS cells. | 7 |
| Wang2022[155] | OS(N/A) | in vitrohumans | circ PVT1 | cisplatindoxorubicinmethotrexate | RT-qPCR | OS and adjacent normal tissues:80 pairs | miR‑24‑3p/KLF8 | CircRNA PVT1 promotes proliferation and chemoresistance of OS cells via the miR‑24‑3p/KLF8 axis. | 4 |
| Pan2021[156] | OS(N/A) | in vitrohumans  | hsa\_circ\_103801 | cisplatin | RT–qPCR | 3/OS patients: 43healthy control:15 | MRP1P-gp | Hsa\_circ\_103801 increased the resistance of OS cells to cisplatin. | 5 |
| Zhang2018[157] | OS(N/A) | in vitrohumans  | circ\_001569 | cisplatin | RT-qPCR | 3/tumor tissues:36normal tissues:36 | Wnt/β-catenin | Expression of circ\_001569 is upregulated in OS promotes cisplatin resistance. | 4 |
| Xie2020[158] | OS(N/A) | in vitrohumans  | hsa\_circ\_0003496 | doxorubicin | RT-qPCR | -/primary OS patients: 35recurrent OS patients:35; | miR-370/KLF12 | Hsa\_circ\_0003496 contributes to chemoresistance in OS. | 8 |
| Lin2022[159] | OS(N/A) | in vitrohumans | has\_circ\_0001982 | paclitaxelcisplatindoxorubicinmethotrexate | RT-qPCR | 3/OS tissue:20drug sensitive:10drug resistant:10 | miR-143 | Hsa\_circ\_0001982 improves multidrug resistance of OS cells. | 3 |
| Ma2021[160] | OS(N/A) | in vitroin vivohumans | circRNA\_0004674 | doxorubicin | RT-qPCR | 3/OS tissues and paracancerous tissues:80 pairs | miR-142-5p/MCL1 | circRNA\_0004674 facilitates OS progression and chemoresistance. | 7 |
| Yuan2021[161] | OS(N/A) | in vitroin vivohumans  | circPRDM2 | doxorubicin | RT-qPCR | -/OS tissue:43normal tissue:43 | miR-760/EZH2 | CircPRDM2 contributes to doxorubicin resistance of OS. | 8 |
| Wei2020[162] | OS(N/A) | in vitroin vivohumans  | circSAMD4A | doxorubicin | RT-qPCR | 3/chemoresistant group:36chemosensitive group:24; | miR-218-5p/KLF8 | CircSAMD4A contributes to cell doxorubicinresistance in OS. | 4 |
| Zhou2021[163] | OS(osteoblastic/fibroblastic OS) | in vitroin vivohumans  | circ ITCH | doxorubicin | RT-qPCR | 3/OS tissue:40(32 osteoblastic and 8 fibroblastic cancer tissues)normal tissue:40; | miR-524/RASSF6 | Down-regulation of circ ITCH promotes OS development and resistance to doxorubicin. | 6 |
| Bai2021[164] | OS(N/A) | in vitroin vivohumans | hsa\_circ\_0004674 | doxorubicin | RT-qPCR | 3/OS tissue:41drug sensitive:23drug resistant:18 | miR-342-3p/FBN1/Wnt/β-catenin  | Hsa\_circ\_0004674 promotes OS doxorubicin resistance by regulating the miR-342-3p/FBN1 axis. | 7 |
| Li2021[165] | OS(N/A) | in vitroin vivohumans | circDOCK1 | cisplatin | RT-qPCR | 3/OS tissues and paracancerous tissues:3 pairsBlood sample:OS patients:70normal control:70 | miR-339-3p/IGF1R | CircDOCK1 promotes cisplatin resistance of OSvia the miR-339-3p/IGF1R axis. | 10 |
| Tang2022[166] | OS(N/A) | in vitroin vivohumans | circ\_ANKIB1 | doxorubicin | RT-qPCR | 3/OS tissues and paracancerous tissues:61 pairs | miR-26b-5p/EZH2 | Circ RNA\_ANKIB1 accelerates chemo-resistance of OS. | 7 |
| Chemotherapy (EWS) |
| Jacques2016[167] | sarcoma(OS/EWS) | in vitro | miR-193a-5p | cisplatin | RT-qPCR | 3 | TAp73β | MiRNA-193a-5p repression of p73 controls cisplatin chemoresistance in primary bone tumors. | 5 |
| Nakatani2012[168] | EWS | in vitrohumans  | miR-34a | doxorubicinvincristine | RT–qPCR | 2/EWS patients:49 | p53 | Restoration of miR-34a activity increase tumour sensitivity to current drugs. | 9 |
| Robin2012[169] | EWS | in vitrohumans  | miR-708 | doxorubicinetoposide | RT-qPCR | 3/EWS sample:23bone marrow:2 | EYA3 | Downregulation of miR-708 resulted in increased chemoresistance in EWS. | 4 |
| Iida2013[170] | EWS | in vitrohumans  | miR-125b | doxorubicinetoposidevincristine | RT-qPCR | 3/EWS tissue:5 | p53Bak | The overexpression of miR-125b in parental EWS cells resulted in enhanced drug resistance. | 4 |
| Chemotherapy (chondrosarcoma) |
| Zhu2014[171] | chondrosarcoma(N/A) | in vitrohumans  | miR-100 | cisplatin | RT-qPCR | 3/chondrosarcoma tissues:6 | mTOR | Overexpression of miR-100 in chondrosarcoma enhances the sensitivity to cisplatin. | 3 |
| Huang2017[172] | chondrosarcoma(N/A) | in vitrohumans  | miR-23b | cisplatin | RT-qPCR | 3/tumor sample:20nontumor sample:10 | Src-AKT | MiR-23b increases the cisplatin sensitivity of chondrosarcoma cells | 5 |
| Tang2016[173] | chondrosarcoma(N/A) | in vitrohumans  | miR-125b | doxorubicin | RT-qPCR | 3/tumor tissue:20normal tissue:20 | ErbB2 | MiR-125b acts as a tumor suppressor in chondrosarcoma cells by the sensitization to doxorubicin. | 4 |
| Chemotherapy (RMS, synovial sarcoma, GIST, ULMS, fibrosarcoma and malignant fibrous histiocytoma) |
| Bharathy2019[174] | RMS | in vitroin vivo | miR-27a | vincristine | RT-qPCR | 3 | PAX3:FOXO1 fusion oncogene | Re-expression of miR-27a led to PAX3:FOXO1 mRNA destabilization and chemotherapy sensitization in RMS cells in culture and in vivo. | 8 |
| Minami2014[175] | synovial sarcoma(N/A) | in vitroin vivohumans  | miR-17 | doxorubicin | RT-PCR | 3/tumor tissue:7 | p21WAF1⁄CIP1 | MiR-17 induces drug resistance in synovial sarcoma cells. | 7 |
| Xu2018[176] | GIST | in vitro | miR‐22-3p | cisplatin | RT-qPCR | 3 | PTEN/PI3K/AKT | MiR-22-3p enhances the chemosensitivity of GIST. | 3 |
| Zhang2020[177] | ULMS | in vitroin vivohumans  | miR-34a | doxorubicin | RT-qPCR | -/ULMS tissues:27myometrium:24uterine leiomyoma:40 | JAK2/STAT3 | Inhibition of miR-34a/JAK2/STAT3 pathway promoted ULMS chemoresistance to doxorubicin. | 9 |
| Jain2022[178] | fibrosarcoma | in vitro | miR-197-5p | doxorubicin | RT-qPCR | 3 | ABCC1MVPp53 | MiR-197-5p increases doxorubicin-mediated anticancer cytotoxicity of fibrosarcoma cells. | 3 |
| Li2021[179] | malignant fibrous histiocytoma  | in vitro | miR-206 | docetaxelgemcitabine | qPCR | 3 | - | Has-miR-206 was lowly expressed in docetaxel-resistant MFH cells and inhibited the growth of MFH cells. | 7 |
| Targeted therapy (OS, GIST and synovial sarcoma) |
| Wang2021[180] | OS(N/A) | in vitroin vivohumans | miR-34a | cabozantinib | RT-qPCR | OS samples: N/Aadjacent normal samples: N/A | Notch pathway | MiR-34a enhanced sensitivity of OS cell to cabozantinib by inhibiting Notch signaling pathway. | 7 |
| Wang2019[181] | OS(N/A) | in vitroin vivohumans  | miR-596 | anlotinib | qPCR | -/OS tissue:74normal tissue:74; | Survivin | MiR-596 enhances the sensitivity of OS cells. | 7 |
| Wang2019[182] | OS(N/A) | in vitroin vivohumans  | miR-499a | erlotinib | RT–qPCR | 3/OS patients: 10 | SHKBP1 | Down-regukation of miR-499 resulted in upregulation of SHKBP1, and increased erlotinib resistance. | 7 |
| Cao2018[183] | GIST | in vitro | lncRNA CCDC26 | imatinib | RT-qPCR | 3 | c-KIT | CCDC26 knockdown enhances resistance of GIST to imatinib. | 4 |
| Yan2019[184] | GIST | in vitro | lncRNA CCDC26 | imatinib  | RT-qPCR | - | IGF-1R | Downregulation of lncRNA CCDC26 contributes toimatinib resistance in human GIST | 3 |
| Zhang2021[185] | GIST | in vitroin vivo | lncRNA-HOTAIR | imatinib | RT-qPCR | 3 | miR-130a/ATG2B | LncRNA-HOTAIR promotes the imatinib resistance of GIST cells | 7 |
| Shao2021[186] | GIST | in vitroin vivohumans | lncRNA RP11-616M22.7 | imatinib | RT-qPCR | GIST samples:20adjacent normal samples: 20 | RASSF1 | RP11-616M22.7 overexpression induces resistance of GIST cells to imatinib. | 6 |
| Fan2014[187] | GIST | in vitro | miR-218 | imatinib | RT–qPCR | - | PI3K/AKT pathway | MicroRNA-218 increase the sensitivity of GIST to imatinib | 4 |
| Chen2020[188] | GIST | in vitroin vivo | miR-30a | imatinib | RT-qPCR | 3 | beclin-1 | MiRNA-30a sensitizes GIST cells to imatinib | 7 |
| Shi2015[189] | GIST | in vitrohumans  | miR-518a-5p | imatinib | RT-qPCR | -/tumor tissue:20normal tissue:20 | PIK3C2A | Low expression of miR-518a-5p is likely to cause resistance to imatinib in GISTs. | 5 |
| Huang2018[190] | GIST | in vitrohumans  | miR-125a-5p | imatinib | RT–qPCR | 3/Imatinib- resistant:13Imatinib sensitivy:15 | pFAK | MiR-125a-5p contributes to imatinib resistance in GIST  | 8 |
| Akcakaya2014[191] | GIST | in vitrohumans  | miR-125a-5p miR-107 | imatinib | RT–qPCR | 3/imatinib resistant:10imatinib sensitive:14 | PTPN18 | Overexpression of miR-125a-5p and miR-107 were associated with imatinib resistance in GIST. | 9 |
| Cao2016[192] | GIST | in vitrohumans  | miR-21 | imatinib | RT-qPCR | 3/GIST specimens: 31 | bcl-2 | MiRNA-21 sensitizes GIST cells to imatinib | 8 |
| Shiozawa2017[193] | synovial sarcoma | in vitro | miR-761 | pazopanib | RT-qPCR | 6 | TRIP6LMNASIRT3 | MicroRNA-761 enhances pazopanib resistance in synovial sarcoma | 6 |
| Immunotherapy (sarcoma) |  |
| Pang2021[194] | sarcoma | - | ADAM6C5orf58CXCR2P1FCGR2CHCP5HLA-HNAPSBNCF1BNCF1C | immune checkpoint inhibitor | - | - | - | High expression of these lncRNAs reduced sensitivity to immune checkpoint inhibitors in sarcoma. | 6 |
| Radiotherapy (OS, chondrosarcoma and atypical teratoid/rhabdoid tumor) |
| He2020[195] | OS(N/A) | in vitrohumans  | LINC00210 | X ray | RT-qPCR | -/tumor tissues:53adjacent normal tissues:53 | miR-342-3p/GFRA1 | LINC00210 knockdown improved the radiosensitivity of OS cells. | 3 |
| Yang2018[196] | OS | in vitroin vivo | miR‑328‑3p | X-ray  | RT-qPCR | - | H2AX | MiR‑328‑3p enhances the radiosensitivity of OS. | 4 |
| Li2019[197] | OS(N/A) | in vitro,in vivohumans  | miR-214 | X ray | qPCR | 3/OS tissue:30normal tissue:30; | PI3K/AKT | Upregulation of miR-214 induced radioresistance of OS. | 4 |
| Dai2018[198] | OS(N/A) | in vitroin vivohumans  | miR-513a-5p | X ray | RT-qPCR | -/OS tissue:30healthy controls:9 | APE1 | MiR-513a-5p could directly lead to radiosensitization. | 6 |
| Vares2020[199] | chondrosarcoma | in vitroin vivo | miR-34 | carbon ions irradiation | RT-qPCR | 3 | FOXO3/KLF4 | MiR-34 overexpression may overcome treatment resistance of high-grade chondrosarcoma to carbon-ion irradiation. | 7 |
| Lee2014[200] | atypicalteratoid/rhabdoid tumor  | in vitroin vivo | miR142-3p | γradiation (IR) | RT-qPCR | 3 | SOX2ADCY9 | Silencing of endogenous miR142-3p promoted the mesenchymal transitional and radioresistant properties of ATRT cells.  | 7 |
| Biomarkers for monitoring treatment response  |
| Polvani2022[201] | OS(osteoblastic/ telangiectatic) | humans | lncRNA growtharrest-specific 5 (GAS5) | - | RT-qPCR | OS tissue:10osteoblastic OS:8telangiectatic OS:2 | - | GAS5 is significantly increased in patients with a good prognosis and is expressed differently between chemosensitive and chemoresistant osteosarcoma patients. | 4 |
| Zhu2015[202] | OS(N/A) | in vitrohumans  | lncRNA ENST00000563280 | doxorubicin | RT-qPCR | chemosesitive group:30chemoresistant group:30 | - | LncRNA ENST00000563280 was distinctly increased in specimens of OS patients with a poor chemoresponse compared to those with a good chemoresponse. | 6 |
| Yuan2012[203] | OS(N/A) | humans  | miR-21 | methotrexatecisplatinadriamycinbleomycin/cyclo-phosphamide/dactinomycin | RT-qPCR | OS patients: 65healthy controls: 30 | - | High serum miR-21 was significantly correlated with advanced Enneking stage and chemotherapeutic resistance in patients with OS. | 5 |
| Lou2016[204] | OS(N/A) | humans  | miR-125b | - | RT-qPCR | resectable OS: 82unresectable OS: 56 | - | Negative correlation was found between miR-125b expression and response to chemotherapy. | 4 |
| Han2020[205] | OS | in vitro | hsa\_circ\_0008336hsa\_circ\_0004664hsa\_circ\_0003302 | cisplatin | RNA sequencingRT-qPCR | - | - | Hsa\_circ\_0008336, hsa\_circ\_0004664, and hsa\_circ\_0003302 were upregulated in cisplatin-resistant cells and may be involved in the pathology of cisplatin resistance in OS. | 3 |
| Zhu2018[206] | OS(N/A) | in vitrohumans  | hsa\_circ\_0004674 | cisplatindoxorubicin | RT-qPCR | OS tissue: 60normal tissue:40 | - | Hsa\_circ\_0004674 was distinctly increased in OS chemoresistant cells and tissues, related to poor prognosis. | 8 |
| YAMADA2021[207] | sarcoma | in vitrohumans  | lncRNA HAR1B | pazopanib | RT-qPCRmicroarray  | -/responder: 16non-responder:23 | - | LncRNA HAR1B expression is higher in responder than in non-responder in patients with sarcoma. | 4 |
| Yan2017[208] | GIST | humans  | lncRNAs | imatinib  | RT-qPCR | 3/normal tissues:3primaryGIST samples:3imatinib-resistant samples:3 | - | LncRNAs may serve as potential biomarkers or drug targets for imatinib-resistant GISTs. | 5 |
| Amirnasr2019[209] | GIST | humans  | miRNAs | imatinib | RT-qPCR | imatinib-naïve (IM-n) tissue:33imatinib-resistant (IM-r) tissue:20 | - | Differentially expressed of miRNAs identified between IM-n and IM-r GIST and highlighted the key miRNAs might be putative treatment targets. | 7 |
| Kou2018[210] | GIST | humans  | miR-518e-5p | imatinib | PCR | serum samples:imatinib resistant GIST patients:39, imatinib-sensitive GIST patients:37, healthy controls:28 | - | Serum miR-518e-5p is a potential biomarker for secondary imatinib-resistant GIST. | 4 |
| Gao2013[211] | GIST | humans  | miR-320a | imatinib | RT-qPCR | 3/pre-imatinib:3imatinib-resistant:12 | - | MiR-320a downregulation is associated with imatinib resistance in GIST. | 4 |
| Zhang2018[212] | GIST | Gene Expression Omnibus database | miR-28-5pmiR-125a-5p | imatinib | - | - | GnRH | Hsa-miR-28-5p and hsa-miR-125a-5p may be able to serve as prognostic markers for imatinib-response in GIST patients. | 5 |

Histological subtype of sarcomas (OS, chondrosarcoma and synovial sarcoma) among the studies explored human tissues have been identified. Abbreviations:ABCG2: ATP binding cassette subfamily G member 2; ADCY9: adenylate cyclase 9; ALDH1A3: aldehyde dehydrogenase 1 family member A3; ATG2B: autophagy-related 2B; ATG4B: autophagy-related 4B; AGTR1: angiotensin II type 1 receptor; AMPKα1: AMP-activated protein kinase alpha 1; BCL2L1: Bcl-2-like protein 1; BMP9: bone morphogenetic protein 9; CD44: cluster of differentiation 44;circ-CHI3L1.2: circRNA circ-chitinase 3-like 1.2; CRYAB: aB-crystallin; DNMT1:Kcnq1/DNA methyltransferase 1; DTL: denticleless protein homolog; DLL1: Delta-like ligand 1; FBN1: fibrillin-1; ERK: extraneous signal regulated kinase; EWS : Ewing’s sarcoma; FGFR: fibroblast growth factor receptor; FOSL2: FOS like 2;EZH2: zeste homolog 2; FZD4: Frizzled class receptor 4; GADD45A: DNA damage-inducible alpha; GFRA1: GDNF family receptor alpha-1; GIST: gastrointestinal stromal tumor; GFRA1: GDNF receptor alpha 1.HDAC4: histone deacetylase 4; HMGB1:high-mobility group box 1; HIF1: hypoxia‑inducible factor-1; IP3K2: inositol 1,4,5-trisphosphate kinase 2; IRS2: insulin receptor substrate 2;KEAP1: kelch-like ECH-associated protein 1;KLF8: Krüppel-like factor 8; KLF12: Krüppel-like factor 12; KCNQ1OT1:lncRNA KCNQ1 opposite strand/antisense transcript 1; LC3: rabbit anti‑light chain 3; LPAATb: lysophosphatidic acid acyltransferase; LPAATβ: lysophosphatidic acid acyltransferase; MAPK7: mitogen activated protein kinase 7; MCL1: myeloid cell leukemia 1; MRP1: multidrug resistance. associated protein-1; MTDH: metadherin; MCL1: myeloid cell leukemia-1; NRF2: nuclearfactor erythroid 2-related factor 2; OS: osteosarcoma; PD‐L1: programmed cell death receptor‐1; PTN: pleiotrophin; PI3K: phosphatidylinositol 3-kinase; PLK1: Polo-like kinase 1; PPP2R2A: PP2A subunit B;RAB11B-AS1: lncRNA RAB11B antisense RNA; RUNX2: Runt-related transcription factor 2; RASSF6: Ras association (RA) domain family; RMS: Rhabdomyosarcoma; S100A11: S100 calcium‑binding protein A11; SDC2: homo sapiens syndecan 2; SOX2: sex-determiningregion Y Box 2; TRIAP1: TP53-regulated inhibitor of apoptosis 1; TGM2: transglutaminase-2;USP1: ubiquitin‑specific protease 1; ULMS: uterine leiomyosarcoma;XIAP: X-linked inhibitor of apoptosis protein; ZNF32:zinc finger protein 32

Reference

1. Xie X, Liu W, Duan Z, Li X, Zhang L and Yang G (2020) LncRNA NORAD targets miR-410-3p to regulate drug resistance sensitivity of osteosarcoma. Cellular and Molecular Biology 66. doi: 10.14715/cmb/2020.66.3.22

2. Li G and Zhu Y (2019) Effect of lncRNA ANRIL knockdown on proliferation and cisplatin chemoresistance of osteosarcoma cells in vitro. Pathol Res Pract 215:931-938. doi: 10.1016/j.prp.2019.01.042

3. Lee AM, Ferdjallah A, Moore E, Kim DC, Nath A, Greengard E and Huang RS (2021) Long Non-Coding RNA ANRIL as a Potential Biomarker of Chemosensitivity and Clinical Outcomes in Osteosarcoma. Int J Mol Sci 22. doi: 10.3390/ijms222011168

4. Wang Y, Zhang L, Zheng X, Zhong W, Tian X, Yin B, Tian K and Zhang W (2016) Long non-coding RNA LINC00161 sensitises osteosarcoma cells to cisplatin-induced apoptosis by regulating the miR-645-IFIT2 axis. Cancer Letters 382:137-146. doi: 10.1016/j.canlet.2016.08.024

5. Zhang QQ, Xu SL, Ding C, Ma CC, Yuan TS, Hua CC and Wang XH (2021) LncRNA FOXD2-AS1 knockdown inhibits the resistance of human osteosarcoma cells to cisplatin by inhibiting miR-143 expression. European review for medical and pharmacological sciences 25:678-686. doi: 10.26355/eurrev\_202101\_24629

6. Li R, Ruan Q, Zheng J, Zhang B and Yang H (2021) LINC01116 Promotes Doxorubicin Resistance in Osteosarcoma by Epigenetically Silencing miR-424-5p and Inducing Epithelial-Mesenchymal Transition. Frontiers in Pharmacology 12. doi: 10.3389/fphar.2021.632206

7. Cheng Y, Shen X, Zheng M, Zou G and Shen Y (2019) Knockdown Of lncRNA NCK-AS1 Regulates Cisplatin Resistance Through Modulating miR-137 In Osteosarcoma Cells. Onco Targets Ther 12:11057-11068. doi: 10.2147/OTT.S228199

8. Zhang L, Wang Y, Li X, Xia X, Li N, He R, He H, Han C and Zhao W (2017) ZBTB7A Enhances Osteosarcoma Chemoresistance by Transcriptionally Repressing lncRNALINC00473-IL24 Activity. Neoplasia 19:908-918. doi: 10.1016/j.neo.2017.08.008

9. Sun YF, Wang Y, Li XD and Wang H (2022) SNHG15, a p53-regulated lncRNA, suppresses cisplatin-induced apoptosis and ROS accumulation through the miR-335-3p/ZNF32 axis. Am J Cancer Res 12:816-828.

10. Wang F, Kong L, Pu Y, Chao F, Zang C, Qin W, Zhao F and Cai S (2021) Long Noncoding RNA DICER1-AS1 Functions in Methylation Regulation on the Multi-Drugresistance of Osteosarcoma Cells via miR-34a-5p and GADD45A. Frontiers in Oncology 11. doi: 10.3389/fonc.2021.685881

11. Song L, Zhou Z, Gan Y, Li P, Xu Y, Zhang Z, Luo F, Xu J, Zhou Q and Dai F (2019) Long noncoding RNA OIP5-AS1 causes cisplatin resistance in osteosarcoma through inducing the LPAATbeta/PI3K/AKT/mTOR signaling pathway by sponging the miR-340-5p. J Cell Biochem 120:9656-9666. doi: 10.1002/jcb.28244

12. Han Z and Shi L (2018) Long non-coding RNA LUCAT1 modulates methotrexate resistance in osteosarcoma via miR-200c/ABCB1 axis. Biochemical and Biophysical Research Communications 495:947-953. doi: 10.1016/j.bbrc.2017.11.121

13. Zhou Q, Hu T and Xu Y (2019) Anticancer potential of TUG1 knockdown in cisplatin-resistant osteosarcoma through inhibition of MET/Akt signalling. Journal of Drug Targeting 28:204-211. doi: 10.1080/1061186x.2019.1644651

14. Hu T, Fei Z, Su H, Xie R and Chen L (2019) Polydatin inhibits proliferation and promotes apoptosis of doxorubicin-resistant osteosarcoma through LncRNA TUG1 mediated suppression of Akt signaling. Toxicology and Applied Pharmacology 371:55-62. doi: 10.1016/j.taap.2019.04.005

15. Sun Z-Y, Jian Y-K, Zhu H-Y and Li B (2019) lncRNAPVT1 targets miR-152 to enhance chemoresistance of osteosarcoma to gemcitabine through activating c-MET/PI3K/AKT pathway. Pathology - Research and Practice 215:555-563. doi: 10.1016/j.prp.2018.12.013

16. Liu C, Han X, Li B, Huang S, Zhou Z, Wang Z and Wang W (2021) MALAT-1 is Associated with the Doxorubicin Resistance in U-2OS Osteosarcoma Cells. Cancer Manag Res 13:6879-6889. doi: 10.2147/CMAR.S304922

17. Pu Y, Tan Y, Zang C, Zhao F, Cai C, Kong L, Deng H, Chao F, Xia R, Xie M, Ge F, Pan Y, Cai S and Huang D (2021) LAMTOR5-AS1 regulates chemotherapy-induced oxidative stress by controlling the expression level and transcriptional activity of NRF2 in osteosarcoma cells. Cell Death Dis 12:1125. doi: 10.1038/s41419-021-04413-0

18. Shen P and Cheng Y (2020) Long noncoding RNA lncARSR confers resistance to Adriamycin and promotes osteosarcoma progression. Cell Death Dis 11:362. doi: 10.1038/s41419-020-2573-2

19. Wang L, Luo Y, Zheng Y, Zheng L, Lin W, Chen Z, Wu S, Chen J and Xie Y (2020) Long non-coding RNA LINC00426 contributes to doxorubicin resistance by sponging miR-4319 in osteosarcoma. Biology Direct 15. doi: 10.1186/s13062-020-00265-4

20. Zhu K-P, Zhang C-L, Ma X-L, Hu J-P, Cai T and Zhang L (2019) Analyzing the Interactions of mRNAs and ncRNAs to Predict Competing Endogenous RNA Networks in Osteosarcoma Chemo-Resistance. Molecular Therapy 27:518-530. doi: 10.1016/j.ymthe.2019.01.001

21. Fu D, Lu C, Qu X, Li P, Chen K, Shan L and Zhu X (2019) LncRNA TTN-AS1 regulates osteosarcoma cell apoptosis and drug resistance via the miR-134-5p/MBTD1 axis. Aging 11:8374-8385. doi: 10.18632/aging.102325

22. Zhang L, Zhao G, Ji S, Yuan Q and Zhou H (2020) Downregulated Long Non-Coding RNA MSC-AS1 Inhibits Osteosarcoma Progression and Increases Sensitivity to Cisplatin by Binding to MicroRNA-142. Medical Science Monitor 26. doi: 10.12659/msm.921594

23. Liu L and Wang S (2020) Long Non-Coding RNA OIP5-AS1 Knockdown Enhances CDDP Sensitivity in Osteosarcoma via miR-377-3p/FOSL2 Axis. Onco Targets Ther 13:3853-3866. doi: 10.2147/OTT.S232918

24. Gu Z, Zhou Y, Cao C, Wang X, Wu L and Ye Z (2020) TFAP2C-mediated LINC00922 signaling underpins doxorubicin-resistant osteosarcoma. Biomedicine & Pharmacotherapy 129. doi: 10.1016/j.biopha.2020.110363

25. Sun X, Tian C, Zhang H, Han K, Zhou M, Gan Z, Zhu H and Min D (2020) Long noncoding RNA OIP5-AS1 mediates resistance to doxorubicin by regulating miR-137-3p/PTN axis in osteosarcoma. Biomedicine & Pharmacotherapy 128. doi: 10.1016/j.biopha.2020.110201

26. Meng Y, Hao D, Huang Y, Jia S, Zhang J, He X, Sun L and Liu D (2020) Positive feedback loop SP1/MIR17HG/miR-130a-3p promotes osteosarcoma proliferation and cisplatin resistance. Biochemical and Biophysical Research Communications 521:739-745. doi: 10.1016/j.bbrc.2019.10.180

27. Liang R, Liu Z, Chen Z, Yang Y, Li Y, Cui Z, Chen A, Long Z, Chen J, Lu J, Huang B and Li Q (2019) Long noncoding RNA DNAJC3-AS1 promotes osteosarcoma progression via its sense-cognate gene DNAJC3. Cancer Medicine 8:761-772. doi: 10.1002/cam4.1955

28. Shi J, Fu Q, Yang P, Yi Z, Liu S and Wang K (2020) Long noncoding

 RNA PWRN1

 is lowly expressed in osteosarcoma and modulates cancer proliferation and migration by targeting

 hsa‐miR

 ‐214‐5p. IUBMB Life 72:2444-2453. doi: 10.1002/iub.2370

29. Zhu K, Yuan Y, Wen J, Chen D, Zhu W, Ouyang Z and Wang W (2020) LncRNA Sox2OT-V7 promotes doxorubicin-induced autophagy and chemoresistance in osteosarcoma via tumor-suppressive miR-142/miR-22. Aging 12:6644-6666. doi: 10.18632/aging.103004

30. Wen J-F, Jiang Y-Q, Li C, Dai X-K, Wu T and Yin W-Z (2020) LncRNA-SARCC sensitizes osteosarcoma to cisplatin through the miR-143-mediated glycolysis inhibition by targeting Hexokinase 2. Cancer Biomarkers 28:231-246. doi: 10.3233/cbm-191181

31. Wang Z, Liu Z and Wu S (2017) Long non-coding RNA CTA sensitizes osteosarcoma cells to doxorubicin through inhibition of autophagy. Oncotarget 8:31465-31477. doi: 10.18632/oncotarget.16356

32. Guo J, Dou D, Zhang T and Wang B (2020) HOTAIR Promotes Cisplatin Resistance of Osteosarcoma Cells by Regulating Cell Proliferation, Invasion, and Apoptosis via miR-106a-5p/STAT3 Axis. Cell Transplantation 29. doi: 10.1177/0963689720948447

33. Zhou B, Li L, Li Y, Sun H and Zeng C (2018) Long noncoding RNA SNHG12 mediates doxorubicin resistance of osteosarcoma via miR-320a/MCL1 axis. Biomedicine & Pharmacotherapy 106:850-857. doi: 10.1016/j.biopha.2018.07.003

34. Zhang C-L, Zhu K-P, Shen G-Q and Zhu Z-S (2015) A long non-coding RNA contributes to doxorubicin resistance of osteosarcoma. Tumor Biology 37:2737-2748. doi: 10.1007/s13277-015-4130-7

35. Cheng FH, Zhao ZS and Liu WD (2019) Long non-coding RNA ROR regulated ABCB1 to induce cisplatin resistance in osteosarcoma by sponging miR-153-3p. European review for medical and pharmacological sciences 23:7256-7265. doi: 10.26355/eurrev\_201909\_18828

36. Zhang CL, Zhu KP and Ma XL (2017) Antisense lncRNA FOXC2-AS1 promotes doxorubicin resistance in osteosarcoma by increasing the expression of FOXC2. Cancer Lett 396:66-75. doi: 10.1016/j.canlet.2017.03.018

37. Kun-Peng Z, Chun-Lin Z, Xiao-Long M and Lei Z (2019) Fibronectin-1 modulated by the long noncoding RNA OIP5-AS1/miR-200b-3p axis contributes to doxorubicin resistance of osteosarcoma cells. J Cell Physiol 234:6927-6939. doi: 10.1002/jcp.27435

38. Li Z, Wang Y, Hu R, Xu R and Xu W (2018) LncRNA B4GALT1-AS1 recruits HuR to promote osteosarcoma cells stemness and migration via

 enhancing YAP transcriptional activity. Cell Proliferation 51. doi: 10.1111/cpr.12504

39. Hu Y, Yang Q, Wang L, Wang S, Sun F, Xu D and Jiang J (2018) Knockdown of the oncogene lncRNA NEAT1 restores the availability of miR-34c and improves the sensitivity to cisplatin in osteosarcoma. Bioscience Reports 38. doi: 10.1042/bsr20180375

40. Li Z, Zhao L and Wang Q (2016) Overexpression of long non-coding RNA HOTTIP increases chemoresistance of osteosarcoma cell by activating the Wnt/β-catenin pathway. American journal of translational research 8:2385-2393.

41. Chen Z, Liu Z, Yang Y, Zhu Z, Liang R, Huang B, Wu D, Yang L, Lu H, Jin D and Li Q (2018) Long non-coding RNA prevents osteosarcoma development and progression via its natural antisense transcript. Oncotarget 9:26770-26786. doi: 10.18632/oncotarget.24247

42. Kun-Peng Z, Xiao-Long M and Chun-Lin Z (2017) LncRNA FENDRR sensitizes doxorubicin-resistance of osteosarcoma cells through down-regulating ABCB1 and ABCC1. Oncotarget 8:71881-71893. doi: 10.18632/oncotarget.17985

43. Zhang J, Rao D, Ma H, Kong D, Xu X and Lu H (2020) LncRNA SNHG15 contributes to doxorubicin resistance of osteosarcoma cells through targeting the miR-381-3p/GFRA1 axis. Open Life Sciences 15:871-883. doi: 10.1515/biol-2020-0086

44. Tang J, Zhu Z, Dong S, Wang Y, Wang J, Chen H and Duan G (2022) Long non-coding RNA long intergenic non-coding 00641 mediates cell progression with stimulating cisplatin-resistance in osteosarcoma cells via microRNA-320d/myeloid cell leukemia-1 axis. Bioengineered 13:7238-7252. doi: 10.1080/21655979.2022.2045090

45. Liu M, Wu L, Cai C, Liu L and Xu Y (2020) MicroRNA-187 suppresses the proliferation migration and invasion of human osteosarcoma cells by targeting MAPK7. Journal of B.U.ON. : official journal of the Balkan Union of Oncology 25:472-478.

46. Patil SL, Palat A, Pan Y, Rajapakshe K, Mirchandani R, Bondesson M, Yustein JT, Coarfa C and Gunaratne PH (2019) MicroRNA-509-3p inhibits cellular migration, invasion, and proliferation, and sensitizes osteosarcoma to cisplatin. Scientific Reports 9. doi: 10.1038/s41598-019-55170-2

47. Wang Y, Shang G, Wang W, Qiu E, Pei Y and Zhang X (2020) Magnoflorine inhibits the malignant phenotypes and increases cisplatin sensitivity of osteosarcoma cells via regulating miR-410-3p/HMGB1/NF-κB pathway. Life Sciences 256. doi: 10.1016/j.lfs.2020.117967

48. Luo DJ, Li LJ, Huo HF, Liu XQ, Cui HW and Jiang DM (2019) MicroRNA-29b sensitizes osteosarcoma cells to doxorubicin by targeting matrix metalloproteinase 9 (MMP-9) in osteosarcoma. European review for medical and pharmacological sciences 23:1434-1442. doi: 10.26355/eurrev\_201902\_17100

49. Li S, Bai H, Chen X, Gong S, Xiao J, Li D, Li L, Jiang Y, Li T, Qin X, Yang H, Wu C, You F and Liu Y (2020) Soft Substrate Promotes Osteosarcoma Cell Self-Renewal, Differentiation, and Drug Resistance Through miR-29b and Its Target Protein Spin 1. ACS Biomaterials Science & Engineering 6:5588-5598. doi: 10.1021/acsbiomaterials.0c00816

50. Vanas V, Haigl B, Stockhammer V and Sutterluty-Fall H (2016) MicroRNA-21 Increases Proliferation and Cisplatin Sensitivity of Osteosarcoma-Derived Cells. PLoS One 11:e0161023. doi: 10.1371/journal.pone.0161023

51. Ziyan W and Yang L (2014) MicroRNA-21 regulates the sensitivity to cisplatin in a human osteosarcoma cell line. Irish Journal of Medical Science (1971 -) 185:85-91. doi: 10.1007/s11845-014-1225-x

52. Bazavar M, Fazli J, Valizadeh A, Ma B, Mohammadi E, Asemi Z, Alemi F, Maleki M, Xing S and Yousefi B (2020) miR-192 enhances sensitivity of methotrexate drug to MG-63 osteosarcoma cancer cells. Pathology - Research and Practice 216. doi: 10.1016/j.prp.2020.153176

53. Xu R, Liu S, Chen H and Lao L (2016) MicroRNA-30a downregulation contributes to chemoresistance of osteosarcoma cells through activating Beclin-1-mediated autophagy. Oncology reports 35:1757-1763. doi: 10.3892/or.2015.4497

54. Wang P, Zhao Zq, Guo Sb, Yang Ty, Chang Zq, Li Dh, Zhao W, Wang Yx, Sun C, Wang Y and Feng W (2019) Roles of microRNA‐22 in Suppressing Proliferation and Promoting Sensitivity of Osteosarcoma Cells

 via

 Metadherin‐mediated Autophagy. Orthopaedic Surgery 11:285-293. doi: 10.1111/os.12442

55. Li X, Wang S, Chen Y, Liu G and Yang X (2014) miR-22 targets the 3' UTR of HMGB1 and inhibits the HMGB1-associated autophagy in osteosarcoma cells during chemotherapy. Tumour Biol 35:6021-8. doi: 10.1007/s13277-014-1797-0

56. Zhu J, Cui K, Cui Y, Ma C and Zhang Z (2020) PLK1 Knockdown Inhibits Cell Proliferation and Cell Apoptosis, and PLK1 Is Negatively Regulated by miR-4779 in Osteosarcoma Cells. DNA and Cell Biology 39:747-755. doi: 10.1089/dna.2019.5002

57. Zhang X, Guo Q, Chen J and Chen Z (2015) Quercetin Enhances Cisplatin Sensitivity of Human Osteosarcoma Cells by Modulating microRNA-217-KRAS Axis. Molecules and Cells 38:638-642. doi: 10.14348/molcells.2015.0037

58. Song L, Duan P, Gan Y, Li P, Zhao C, Xu J, Zhang Z and Zhou Q (2017) MicroRNA-340-5p modulates cisplatin resistance by targeting LPAATbeta in osteosarcoma. Braz J Med Biol Res 50:e6359. doi: 10.1590/1414-431X20176359

59. Song YD, Li DD, Guan Y, Wang YL and Zheng J (2017) miR-214 modulates cisplatin sensitivity of osteosarcoma cells through regulation of anaerobic glycolysis. Cellular and Molecular Biology 63. doi: 10.14715/cmb/2017.63.9.14

60. Di Fiore R, Drago-Ferrante R, Pentimalli F, Di Marzo D, Forte IM, Carlisi D, De Blasio A, Tesoriere G, Giordano A and Vento R (2016) Let-7d miRNA Shows Both Antioncogenic and Oncogenic Functions in Osteosarcoma-Derived 3AB-OS Cancer Stem Cells. Journal of Cellular Physiology 231:1832-1841. doi: 10.1002/jcp.25291

61. Zhang Y, Duan G and Feng S (2015) MicroRNA-301a modulates doxorubicin resistance in osteosarcoma cells by targeting AMP-activated protein kinase alpha 1. Biochemical and Biophysical Research Communications 459:367-373. doi: 10.1016/j.bbrc.2015.02.101

62. Meng CY, Zhao ZQ, Bai R, Zhao W, Wang YX, Sun L, Sun C, Feng W and Guo SB (2020) MicroRNA‑22 regulates autophagy and apoptosis in cisplatin resistance of osteosarcoma. Molecular Medicine Reports. doi: 10.3892/mmr.2020.11447

63. Meng CY, Zhao ZQ, Bai R, Zhao W, Wang YX, Xue HQ, Sun L, Sun C, Feng W and Guo SB (2020) MicroRNA‑22 mediates the cisplatin resistance of osteosarcoma cells by inhibiting autophagy via the PI3K/Akt/mTOR pathway. Oncology Reports. doi: 10.3892/or.2020.7492

64. Yuan G, Zhao Y, Wu D, Gao C and Jiao Z (2018) miRNA-20a upregulates TAK1 and increases proliferation in osteosarcoma cells. Future oncology (London, England) 14:461-469. doi: 10.2217/fon-2017-0490

65. Lin BC, Huang D, Yu CQ, Mou Y, Liu YH, Zhang DW and Shi FJ (2016) MicroRNA-184 Modulates Doxorubicin Resistance in Osteosarcoma Cells by Targeting BCL2L1. Med Sci Monit 22:1761-5. doi: 10.12659/msm.896451

66. Lei W, Yan C, Ya J, Yong D, Yujun B and Kai L (2018) MiR-199a-3p affects the multi-chemoresistance of osteosarcoma through targeting AK4. BMC Cancer 18:631. doi: 10.1186/s12885-018-4460-0

67. Pu Y, Zhao F, Wang H, Cai W, Gao J, Li Y and Cai S (2016) MiR-34a-5p promotes the multi-drug resistance of osteosarcoma by targeting the CD117 gene. Oncotarget 7:28420-28434. doi: 10.18632/oncotarget.8546

68. Song B, Wang Y, Titmus MA, Botchkina G, Formentini A, Kornmann M and Ju J (2010) Molecular mechanism of chemoresistance by miR-215 in osteosarcoma and colon cancer cells. Molecular cancer 9:96. doi: 10.1186/1476-4598-9-96

69. Li Q-C, Xu H, Wang X, Wang T and Wu J (2017) miR-34a increases cisplatin sensitivity of osteosarcoma cells in vitro through up-regulation of c-Myc and Bim signal. Cancer Biomarkers 21:135-144. doi: 10.3233/cbm-170452

70. Zhou Y, Zhao RH, Tseng KF, Li KP, Lu ZG, Liu Y, Han K, Gan ZH, Lin SC, Hu HY and Min DL (2016) Sirolimus induces apoptosis and reverses multidrug resistance in human osteosarcoma cells in vitro via increasing microRNA-34b expression. Acta Pharmacol Sin 37:519-29. doi: 10.1038/aps.2015.153

71. Chang Z, Huo L, Li K, Wu Y and Hu Z (2014) Blocked autophagy by miR-101 enhances osteosarcoma cell chemosensitivity in vitro. ScientificWorldJournal 2014:794756. doi: 10.1155/2014/794756

72. Gao Y, Feng Y, Shen JK, Lin M, Choy E, Cote GM, Harmon DC, Mankin HJ, Hornicek FJ and Duan Z (2015) CD44 is a direct target of miR-199a-3p and contributes to aggressive progression in osteosarcoma. Scientific Reports 5. doi: 10.1038/srep11365

73. Di Fiore R, Drago-Ferrante R, Pentimalli F, Di Marzo D, Forte IM, D’Anneo A, Carlisi D, De Blasio A, Giuliano M, Tesoriere G, Giordano A and Vento R (2014) MicroRNA-29b-1 impairs in vitro cell proliferation, self-renewal and chemoresistance of human osteosarcoma 3AB-OS cancer stem cells. International Journal of Oncology 45:2013-2023. doi: 10.3892/ijo.2014.2618

74. Wei R, Cao G, Deng Z, Su J and Cai L (2016) miR-140-5p attenuates chemotherapeutic drug-induced cell death by regulating autophagy through inositol 1,4,5-trisphosphate kinase 2 (IP3k2) in human osteosarcoma cells. Bioscience Reports 36. doi: 10.1042/bsr20160238

75. Xie Z, Xu J, Peng L, Gao Y, Zhao H and Qu Y (2018) miR-149 promotes human osteocarcinoma progression via targeting bone morphogenetic protein 9 (BMP9). Biotechnology letters 40:47-55. doi: 10.1007/s10529-017-2445-8

76. Novello C, Pazzaglia L, Conti A, Quattrini I, Pollino S, Perego P, Picci P and Benassi MS (2014) p53-dependent activation of microRNA-34a in response to etoposide-induced DNA damage in osteosarcoma cell lines not impaired by dominant negative p53 expression. PloS one 9:e114757. doi: 10.1371/journal.pone.0114757

77. Chen L, Jiang K, Jiang H and Wei P (2014) miR-155 mediates drug resistance in osteosarcoma cells via inducing autophagy. Exp Ther Med 8:527-532. doi: 10.3892/etm.2014.1752

78. Li Y, Jiang W, Hu Y, Da Z, Zeng C, Tu M, Deng Z and Xiao W (2016) MicroRNA-199a-5p inhibits cisplatin-induced drug resistance via inhibition of autophagy in osteosarcoma cells. Oncol Lett 12:4203-4208. doi: 10.3892/ol.2016.5172

79. Huang Z, Huang L, Liu L, Wang L, Lin W, Zhu X, Su W and Lv C (2021) Knockdown of microRNA-203 reduces cisplatin chemo-sensitivity to osteosarcoma cell lines MG63 and U2OS in vitro by targeting RUNX2. Journal of Chemotherapy 33:328-341. doi: 10.1080/1120009x.2021.1899441

80. Zou Y, Yang J, Wu J, Luo C and Huang Y (2017) miR‑133b induces chemoresistance of osteosarcoma cells to cisplatin treatment by promoting cell death, migration and invasion. Oncology Letters. doi: 10.3892/ol.2017.7432

81. Zhu M, Wu Y, Wang Z, Lin M, Su B, Li C, Liang F and Chen X (2020) miR‑128‑3p serves as an oncogenic microRNA in osteosarcoma cells by downregulating ZC3H12D. Oncology Letters 21. doi: 10.3892/ol.2020.12413

82. Zhang B, Liu Y and Zhang J (2018) Silencing of miR‑19a‑3p enhances osteosarcoma cells chemosensitivity by elevating the expression of tumor suppressor PTEN. Oncology Letters. doi: 10.3892/ol.2018.9592

83. Jiang L, He A, He X and Tao C (2015) MicroRNA-126 enhances the sensitivity of osteosarcoma cells to cisplatin and methotrexate. Oncology Letters 10:3769-3778. doi: 10.3892/ol.2015.3790

84. Chen X, Chen X-G, Hu X, Song T, Ou X, Zhang C, Zhang W and Zhang C (2016) MiR-34a and miR-203 Inhibit Survivin Expression to Control Cell Proliferation and Survival in Human Osteosarcoma Cells. Journal of Cancer 7:1057-1065. doi: 10.7150/jca.15061

85. Yu T, Chen D, Zhang L and Wan D (2019) <p>microRNA-26a-5p Promotes Proliferation and Migration of Osteosarcoma Cells by Targeting <em>HOXA5</em> in vitro and in vivo</p>. OncoTargets and Therapy Volume 12:11555-11565. doi: 10.2147/ott.S232100

86. Pu Y, Zhao F, Wang H and Cai S (2017) MiR-34a-5p promotes multi-chemoresistance of osteosarcoma through down-regulation of the DLL1 gene. Sci Rep 7:44218. doi: 10.1038/srep44218

87. Song B, Wang Y, Xi Y, Kudo K, Bruheim S, Botchkina GI, Gavin E, Wan Y, Formentini A, Kornmann M, Fodstad O and Ju J (2009) Mechanism of chemoresistance mediated by miR-140 in human osteosarcoma and colon cancer cells. Oncogene 28:4065-74. doi: 10.1038/onc.2009.274

88. Pu Y, Zhao F, Li Y, Cui M, Wang H, Meng X and Cai S (2017) The miR-34a-5p promotes the multi-chemoresistance of osteosarcoma via repression of the AGTR1 gene. BMC Cancer 17. doi: 10.1186/s12885-016-3002-x

89. Osaki S, Tazawa H, Hasei J, Yamakawa Y, Omori T, Sugiu K, Komatsubara T, Fujiwara T, Sasaki T, Kunisada T, Yoshida A, Urata Y, Kagawa S, Ozaki T and Fujiwara T (2016) Ablation of MCL1 expression by virally induced microRNA-29 reverses chemoresistance in human osteosarcomas. Scientific Reports 6. doi: 10.1038/srep28953

90. Zhang Q, Wu J, Zhang X, Cao L, Wu Y and Miao X (2021) Transcription factor ELK1 accelerates aerobic glycolysis to enhance osteosarcoma chemoresistance through miR-134/PTBP1 signaling cascade. Aging 13:6804-6819. doi: 10.18632/aging.202538

91. Zhao F, Pu Y, Cui M, Wang H and Cai S (2017) MiR-20a-5p represses the multi-drug resistance of osteosarcoma by targeting the SDC2 gene. Cancer cell international 17:100. doi: 10.1186/s12935-017-0470-2

92. Wang H, Zhao F, Cai S and Pu Y (2019) MiR-193a regulates chemoresistance of human osteosarcoma cells via repression of IRS2. Journal of Bone Oncology 17. doi: 10.1016/j.jbo.2019.100241

93. Guo X, Yu L, Zhang Z, Dai G, Gao T and Guo W (2017) miR-335 negatively regulates osteosarcoma stem cell-like properties by targeting POU5F1. Cancer cell international 17:29. doi: 10.1186/s12935-017-0398-6

94. Cheng M, Duan PG, Gao ZZ and Dai M (2020) MicroRNA‑487b‑3p inhibits osteosarcoma chemoresistance and metastasis by targeting ALDH1A3. Oncology Reports 44:2691-2700. doi: 10.3892/or.2020.7814

95. Yu WC, Chen HH, Qu YY, Xu CW, Yang C and Liu Y (2019) MicroRNA-221 promotes cisplatin resistance in osteosarcoma cells by targeting PPP2R2A. Biosci Rep 39. doi: 10.1042/BSR20190198

96. Tsai HC, Chang AC, Tsai CH, Huang YL, Gan L, Chen CK, Liu SC, Huang TY, Fong YC and Tang CH (2019) CCN2 promotes drug resistance in osteosarcoma by enhancing ABCG2 expression. J Cell Physiol 234:9297-9307. doi: 10.1002/jcp.27611

97. Meng Y, Gao R, Ma J, Zhao J, Xu E, Wang C and Zhou X (2017) MicroRNA-140-5p regulates osteosarcoma chemoresistance by targeting HMGN5 and autophagy. Scientific Reports 7. doi: 10.1038/s41598-017-00405-3

98. Zhang Y, Cai W, Zou Y and Zhang H (2020) Knockdown of KCNQ1OT1 Inhibits Proliferation, Invasion, and Drug Resistance by Regulating miR-129-5p-Mediated LARP1 in Osteosarcoma. Biomed Res Int 2020:7698767. doi: 10.1155/2020/7698767

99. Liu Y, Gu S, Li H, Wang J, Wei C and Liu Q (2019) SNHG16 promotes osteosarcoma progression and enhances cisplatin resistance by sponging miR-16 to upregulate ATG4B expression. Biochemical and Biophysical Research Communications 518:127-133. doi: 10.1016/j.bbrc.2019.08.019

100. Keremu A, Aini A, Maimaitirexiati Y, Liang Z, Aila P, Xierela P, Tusun A, Moming H and Yusufu A (2019) Overcoming cisplatin resistance in osteosarcoma through the miR-199a-modulated inhibition of HIF-1α. Bioscience Reports 39. doi: 10.1042/bsr20170080

101. Yan H, Zhang B, Fang C and Chen L (2018) miR-340 alleviates chemoresistance of osteosarcoma cells by targeting ZEB1. Anti-Cancer Drugs 29:440-448. doi: 10.1097/cad.0000000000000614

102. Xiao Q, Yang Y, An Q and Qi Y (2017) MicroRNA-100 suppresses human osteosarcoma cell proliferation and chemo-resistance via ZNRF2. Oncotarget 8:34678-34686. doi: 10.18632/oncotarget.16149

103. Wang SN, Luo S, Liu C, Piao Z, Gou W, Wang Y, Guan W, Li Q, Zou H, Yang ZZ, Wang D, Wang Y, Xu M, Jin H and Xu CX (2017) miR-491 Inhibits Osteosarcoma Lung Metastasis and Chemoresistance by Targeting alphaB-crystallin. Mol Ther 25:2140-2149. doi: 10.1016/j.ymthe.2017.05.018

104. Zhou X, Natino D, Zhai X, Gao Z and He X (2018) MicroRNA22 inhibits the proliferation and migration, and increases the cisplatin sensitivity, of osteosarcoma cells. Mol Med Rep 17:7209-7217. doi: 10.3892/mmr.2018.8790

105. Zhang L, Yang P, Liu Q, Wang J, Yan F, Duan L and Lin F (2020) KLF8 promotes cancer stem cell-like phenotypes in osteosarcoma through miR-429-SOX2 signaling. Neoplasma 67:519-527. doi: 10.4149/neo\_2020\_190711N624

106. Xu M, Jin H, Xu CX, Bi WZ and Wang Y (2014) MiR-34c inhibits osteosarcoma metastasis and chemoresistance. Med Oncol 31:972. doi: 10.1007/s12032-014-0972-x

107. Duan Z, Gao Y, Shen J, Choy E, Cote G, Harmon D, Bernstein K, Lozano-Calderon S, Mankin H and Hornicek FJ (2017) miR-15b modulates multidrug resistance in human osteosarcoma in vitro and in vivo. Mol Oncol 11:151-166. doi: 10.1002/1878-0261.12015

108. Maximov VV, Akkawi R, Khawaled S, Salah Z, Jaber L, Barhoum A, Or O, Galasso M, Kurek KC, Yavin E and Aqeilan RI (2019) MiR‐16‐1‐3p and miR‐16‐2‐3p possess strong tumor suppressive and antimetastatic properties in osteosarcoma. International Journal of Cancer 145:3052-3063. doi: 10.1002/ijc.32368

109. Chen R, Li X, He B and Hu W (2017) MicroRNA-410 regulates autophagy-related gene ATG16L1 expression and enhances chemosensitivity via autophagy inhibition in osteosarcoma. Mol Med Rep 15:1326-1334. doi: 10.3892/mmr.2017.6149

110. Lin Z, Song D, Wei H, Yang X, Liu T, Yan W and Xiao J (2016) TGF-β1-induced miR-202 mediates drug resistance by inhibiting apoptosis in human osteosarcoma. Journal of cancer research and clinical oncology 142:239-246. doi: 10.1007/s00432-015-2028-9

111. Zhao G, Cai C, Yang T, Qiu X, Liao B, Li W, Ji Z, Zhao J, Zhao H, Guo M, Ma Q, Xiao C, Fan Q and Ma B (2013) MicroRNA-221 induces cell survival and cisplatin resistance through PI3K/Akt pathway in human osteosarcoma. PLoS One 8:e53906. doi: 10.1371/journal.pone.0053906

112. Zhou C, Tan W, Lv H, Gao F and Sun J (2016) Hypoxia-inducible microRNA-488 regulates apoptosis by targeting Bim in osteosarcoma. Cell Oncol (Dordr) 39:463-471. doi: 10.1007/s13402-016-0288-2

113. Wang Y, Wu Y, Cai A, Ma C, Cai S, Wang H, Que Y, Xu S, Xu T and Hu Y (2020) Cisplatin inhibits the proliferation of Saos-2 osteosarcoma cells via the miR-376c/TGFA pathway. Bosnian Journal of Basic Medical Sciences. doi: 10.17305/bjbms.2020.4485

114. Yang D, Xu T, Fan L, Liu K and Li G (2020) microRNA-216b enhances cisplatin-induced apoptosis in osteosarcoma MG63 and SaOS-2 cells by binding to JMJD2C and regulating the HIF1α/HES1 signaling axis. Journal of Experimental & Clinical Cancer Research 39. doi: 10.1186/s13046-020-01670-3

115. Xu W, Li Z, Zhu X, Xu R and Xu Y (2018) miR-29 Family Inhibits Resistance to Methotrexate and Promotes Cell Apoptosis by Targeting COL3A1 and MCL1 in Osteosarcoma. Med Sci Monit 24:8812-8821. doi: 10.12659/MSM.911972

116. Zhou J, Wu S, Chen Y, Zhao J, Zhang K, Wang J and Chen S (2015) microRNA-143 is associated with the survival of ALDH1+CD133+ osteosarcoma cells and the chemoresistance of osteosarcoma. Exp Biol Med (Maywood) 240:867-75. doi: 10.1177/1535370214563893

117. Liu Y, Zhu ST, Wang X, Deng J, Li WH, Zhang P and Liu BS (2016) MiR-100 Inhibits Osteosarcoma Cell Proliferation, Migration, and Invasion and Enhances Chemosensitivity by Targeting IGFIR. Technol Cancer Res Treat 15:NP40-8. doi: 10.1177/1533034615601281

118. Shao XJ, Miao MH, Xue J, Xue J, Ji XQ and Zhu H (2015) The Down-Regulation of MicroRNA-497 Contributes to Cell Growth and Cisplatin Resistance Through PI3K/Akt Pathway in Osteosarcoma. Cell Physiol Biochem 36:2051-62. doi: 10.1159/000430172

119. Xu E, Zhao J, Ma J, Wang C, Zhang C, Jiang H, Cheng J, Gao R and Zhou X (2016) miR-146b-5p promotes invasion and metastasis contributing to chemoresistance in osteosarcoma by targeting zinc and ring finger 3. Oncol Rep 35:275-83. doi: 10.3892/or.2015.4393

120. Zhou Y, Huang Z, Wu S, Zang X, Liu M and Shi J (2014) miR-33a is up-regulated in chemoresistant osteosarcoma and promotes osteosarcoma cell resistance to cisplatin by down-regulating TWIST. Journal of experimental & clinical cancer research : CR 33:12. doi: 10.1186/1756-9966-33-12

121. Liu Q, Wang Z, Zhou X, Tang M, Tan W, Sun T and Deng Y (2019) miR-342-5p inhibits osteosarcoma cell growth, migration, invasion, and sensitivity to Doxorubicin through targeting Wnt7b. Cell Cycle 18:3325-3336. doi: 10.1080/15384101.2019.1676087

122. Liu Q, Song Y, Duan X, Chang Y and Guo J (2018) MiR-92a Inhibits the Progress of Osteosarcoma Cells and Increases the Cisplatin Sensitivity by Targeting Notch1. Biomed Res Int 2018:9870693. doi: 10.1155/2018/9870693

123. Li G, Li Y and Wang Dy (2021) Overexpression of miR‐329‐3p sensitizes osteosarcoma cells to cisplatin through suppression of glucose metabolism by targeting LDHA. Cell Biology International 45:766-774. doi: 10.1002/cbin.11476

124. Tang Q, Yuan Q, Li H, Wang W, Xie G, Zhu K and Li D (2018) miR-223/Hsp70/JNK/JUN/miR-223 feedback loop modulates the chemoresistance of osteosarcoma to cisplatin. Biochem Biophys Res Commun 497:827-834. doi: 10.1016/j.bbrc.2018.02.091

125. Xu M, Jin H, Xu C-X, Sun B, Mao Z, Bi W-Z and Wang Y (2014) miR-382 inhibits tumor growth and enhance chemosensitivity in osteosarcoma. Oncotarget 5:9472-9483.

126. Liu XG, Xu J, Li F, Li MJ and Hu T (2018) Down-regulation of miR-377 contributes to cisplatin resistance by targeting XIAP in osteosarcoma. European review for medical and pharmacological sciences 22:1249-1257. doi: 10.26355/eurrev\_201803\_14465

127. Liu Y, Zhu S-T, Wang X, Deng J, Li W-H, Zhang P and Liu B-S (2017) MiR-200c regulates tumor growth and chemosensitivity to cisplatin in osteosarcoma by targeting AKT2. Scientific Reports 7. doi: 10.1038/s41598-017-14088-3

128. Zhu Z, Tang J, Wang J, Duan G, Zhou L and Zhou X (2016) MiR-138 Acts as a Tumor Suppressor by Targeting EZH2 and Enhances Cisplatin-Induced Apoptosis in Osteosarcoma Cells. PLoS One 11:e0150026. doi: 10.1371/journal.pone.0150026

129. Long X and Lin XJ (2019) P65-mediated miR-590 inhibition modulates the chemoresistance of osteosarcoma to doxorubicin through targeting wild-type p53-induced phosphatase 1. J Cell Biochem 120:5652-5665. doi: 10.1002/jcb.27849

130. Li Y, Zhao C, Yu Z, Chen J, She X, Li P, Liu C, Zhang Y, Feng J, Fu H, Wang B, Kuang L, Li L, Lv G and Wu M (2016) Low expression of miR-381 is a favorite prognosis factor and enhances the chemosensitivity of osteosarcoma. Oncotarget 7:68585-68596. doi: 10.18632/oncotarget.11861

131. Wang GC, He QY, Tong DK, Wang CF, Liu K, Ding C, Ji F and Zhang H (2016) MiR-367 negatively regulates apoptosis induced by adriamycin in osteosarcoma cells by targeting KLF4. J Bone Oncol 5:51-6. doi: 10.1016/j.jbo.2016.02.002

132. Li M and Ma W (2021) miR-26a Reverses Multidrug Resistance in Osteosarcoma by Targeting MCL1. Front Cell Dev Biol 9:645381. doi: 10.3389/fcell.2021.645381

133. Jin C, Feng Y, Ni Y and Shan Z (2017) MicroRNA-610 suppresses osteosarcoma oncogenicity via targeting TWIST1 expression. Oncotarget 8:56174-56184. doi: 10.18632/oncotarget.17045

134. Li L, Kong Xa, Zang M, Hu B, Fang X, Gui B and Hu Y (2020) <p>MicroRNA-584 Impairs Cellular Proliferation and Sensitizes Osteosarcoma Cells to Cisplatin and Taxanes by Targeting CCN2</p>. Cancer Management and Research Volume 12:2577-2587. doi: 10.2147/cmar.S246545

135. Chen X, Lv C, Zhu X, Lin W, Wang L, Huang Z, Yang S and Sun J (2018) MicroRNA‑504 modulates osteosarcoma cell chemoresistance to cisplatin by targeting p53. Oncology Letters. doi: 10.3892/ol.2018.9749

136. Zhou S, Xiong M, Dai G, Yu L, Zhang Z, Chen J and Guo W (2018) MicroRNA-192-5p suppresses the initiation and progression of osteosarcoma by targeting USP1. Oncol Lett 15:6947-6956. doi: 10.3892/ol.2018.8180

137. Ling Z, Fan G, Yao D, Zhao J, Zhou Y, Feng J, Zhou G and Chen Y (2020) MicroRNA-150 functions as a tumor suppressor and sensitizes osteosarcoma to doxorubicin-induced apoptosis by targeting RUNX2. Exp Ther Med 19:481-488. doi: 10.3892/etm.2019.8231

138. Sun Y, He N, Dong Y and Jiang C (2016) MiR-24-BIM-Smac/DIABLO axis controls the sensitivity to doxorubicin treatment in osteosarcoma. Scientific Reports 6. doi: 10.1038/srep34238

139. Zhi W, Feng Q and Mingzhu Z (2022) MiR-140 targets Wnt1 to inhibit the proliferation and enhance drug sensitivity in osteosarcoma cells. Cell Mol Biol (Noisy-le-grand) 68:140-146. doi: 10.14715/cmb/2022.68.1.18

140. Zhou X, Wei P, Wang X, Zhang J and Shi Y (2021) miR-141-3p promotes the cisplatin sensitivity of osteosarcoma cell through targeting the Glutaminase (GLS)-mediated glutamine metabolism. Curr Mol Med. doi: 10.2174/1566524021666211004112055

141. Liang W, Li C, Li M, Wang D and Zhong Z (2019) <p>MicroRNA-765 sensitizes osteosarcoma cells to cisplatin via downregulating APE1 expression</p>. OncoTargets and Therapy Volume 12:7203-7214. doi: 10.2147/ott.S194800

142. Gao S, Wang K and Wang X (2020) miR-375 targeting autophagy-related 2B (ATG2B) suppresses autophagy and tumorigenesis in cisplatin-resistant osteosarcoma cells. Neoplasma 67:724-734. doi: 10.4149/neo\_2020\_190423N366

143. Wang J, Zhang Z, Qiu C and Wang J (2021) MicroRNA‐519d‐3p antagonizes osteosarcoma resistance against cisplatin by targeting PD‐L1. Molecular Carcinogenesis. doi: 10.1002/mc.23370

144. Wang P, Huang Y, Xia X, Han J, Zhang L and Zhao W (2022) Pleckstrin homology-like domain family A, member 3, a miR-19a-3p-regulated gene, suppresses tumor growth in osteosarcoma by downregulating the Akt pathway. Bioengineered 13:3993-4009. doi: 10.1080/21655979.2022.2031404

145. Zhan H, Xiao J, Wang P, Mo F, Li K, Guo F, Yu X, Liu X, Zhang B, Dai M and Liu H (2022) Exosomal CTCF Confers Cisplatin Resistance in Osteosarcoma by Promoting Autophagy via the IGF2-AS/miR-579-3p/MSH6 Axis. J Oncol 2022:9390611. doi: 10.1155/2022/9390611

146. Zhang Z, Zhou Q, Luo F, Zhou R, Xu J, Xiao J, Dai F and Song L (2021) Circular RNA circ-CHI3L1.2 modulates cisplatin resistance of osteosarcoma cells via the miR-340-5p/LPAATβ axis. Human Cell 34:1558-1568. doi: 10.1007/s13577-021-00564-6

147. Zhang J, Ma X, Zhou R and Zhou Y (2020) <p>TRPS1 and YAP1 Regulate Cell Proliferation and Drug Resistance of Osteosarcoma via Competitively Binding to the Target of circTADA2A – miR-129-5p</p>. OncoTargets and Therapy Volume 13:12397-12407. doi: 10.2147/ott.S276953

148. Feng ZH, Zheng L, Yao T, Tao SY, Wei XA, Zheng ZY, Zheng BJ, Zhang XY, Huang B, Liu JH, Chen YL, Shan Z, Yuan PT, Wang CG, Chen J, Shen SY and Zhao FD (2021) EIF4A3-induced circular RNA PRKAR1B promotes osteosarcoma progression by miR-361-3p-mediated induction of FZD4 expression. Cell Death Dis 12:1025. doi: 10.1038/s41419-021-04339-7

149. Dong L and Qu F (2020) CircUBAP2 promotes SEMA6D expression to enhance the cisplatin resistance in osteosarcoma through sponging miR-506-3p by activating Wnt/β-catenin signaling pathway. Journal of Molecular Histology 51:329-340. doi: 10.1007/s10735-020-09883-8

150. Wei W, Ji L, Duan W and Zhu J (2021) Circular RNA circ\_0081001 knockdown enhances methotrexate sensitivity in osteosarcoma cells by regulating miR-494-3p/TGM2 axis. J Orthop Surg Res 16:50. doi: 10.1186/s13018-020-02169-5

151. Hu Y, Gu J, Shen H, Shao T, Li S, Wang W and Yu Z (2019) Circular RNA LARP4 correlates with decreased Enneking stage, better histological response, and prolonged survival profiles, and it elevates chemosensitivity to cisplatin and doxorubicin via sponging microRNA‐424 in osteosarcoma. Journal of Clinical Laboratory Analysis 34. doi: 10.1002/jcla.23045

152. Li X, Liu Y, Zhang X, Shen J, Xu R, Liu Y and Yu X (2020) Circular RNA hsa\_circ\_0000073 contributes to osteosarcoma cell proliferation, migration, invasion and methotrexate resistance by sponging miR-145-5p and miR-151-3p and upregulating NRAS. Aging 12:14157-14173. doi: 10.18632/aging.103423

153. Li D, Huang Y, Wang G and Zhao F (2021) Circular RNA circPVT1 Contributes to Doxorubicin (DXR) Resistance of Osteosarcoma Cells by Regulating TRIAP1 via miR-137. BioMed Research International 2021:1-19. doi: 10.1155/2021/7463867

154. Kun-Peng Z, Xiao-Long M and Chun-Lin Z (2018) Overexpressed circPVT1, a potential new circular RNA biomarker, contributes to doxorubicin and cisplatin resistance of osteosarcoma cells by regulating ABCB1. Int J Biol Sci 14:321-330. doi: 10.7150/ijbs.24360

155. Wang B, Yan L, Shi W, Xie H, Chen R, Shao Y and Liang W (2022) CircRNA PVT1 promotes proliferation and chemoresistance of osteosarcoma cells via the miR-24-3p/KLF8 axis. Int J Clin Oncol 27:811-822. doi: 10.1007/s10147-022-02122-y

156. Pan Y, Lin Y and Mi C (2021) Cisplatin-resistant osteosarcoma cell-derived exosomes confer cisplatin resistance to recipient cells in an exosomal circ\_103801-dependent manner. Cell Biol Int 45:858-868. doi: 10.1002/cbin.11532

157. Zhang H, Yan J, Lang X and Zhuang Y (2018) Expression of circ\_001569 is upregulated in osteosarcoma and promotes cell proliferation and cisplatin resistance by activating the Wnt/beta-catenin signaling pathway. Oncol Lett 16:5856-5862. doi: 10.3892/ol.2018.9410

158. Xie C, Liang G, Xu Y and Lin E (2020) <p>Circular RNA hsa\_circ\_0003496 Contributes to Tumorigenesis and Chemoresistance in Osteosarcoma Through Targeting (microRNA) miR-370/Krüppel-Like Factor 12 Axis</p>. Cancer Management and Research Volume 12:8229-8240. doi: 10.2147/cmar.S253969

159. Lin B, Nan J, Lu K, Zong Y and Fan W (2022) Hsa\_circ\_0001982 promotes the proliferation, invasion, and multidrug resistance of osteosarcoma cells. J Clin Lab Anal 36. doi: 10.1002/jcla.24493

160. Ma XL, Zhan TC, Hu JP, Zhang CL and Zhu KP (2021) Doxorubicin-induced novel circRNA\_0004674 facilitates osteosarcoma progression and chemoresistance by upregulating MCL1 through miR-142-5p. Cell Death Discov 7:309. doi: 10.1038/s41420-021-00694-8

161. Yuan J, Liu Y, Zhang Q, Ren Z, Li G and Tian R (2021) CircPRDM2 Contributes to Doxorubicin Resistance of Osteosarcoma by Elevating EZH2 via Sponging miR-760. Cancer Manag Res 13:4433-4445. doi: 10.2147/CMAR.S295147

162. Wei W, Ji L, Duan W and Zhu J (2020) CircSAMD4A contributes to cell doxorubicin resistance in osteosarcoma by regulating the miR-218-5p/KLF8 axis. Open Life Sciences 15:848-859. doi: 10.1515/biol-2020-0079

163. Zhou W, Liu Y and Wu X (2021) Down-regulation of circITCH promotes osteosarcoma development and resistance to doxorubicin via the miR-524/RASSF6 axis. J Gene Med 23:e3373. doi: 10.1002/jgm.3373

164. Bai Y, Li Y, Bai J and Zhang Y (2021) Hsa\_circ\_0004674 promotes osteosarcoma doxorubicin resistance by regulating the miR-342-3p/FBN1 axis. Journal of Orthopaedic Surgery and Research 16. doi: 10.1186/s13018-021-02631-y

165. Li S, Liu F, Zheng K, Wang W, Qiu E, Pei Y, Wang S, Zhang J and Zhang X (2021) CircDOCK1 promotes the tumorigenesis and cisplatin resistance of osteogenic sarcoma via the miR-339-3p/IGF1R axis. Mol Cancer 20:161. doi: 10.1186/s12943-021-01453-0

166. Tang J, Duan G, Wang Y, Wang B, Li W and Zhu Z (2022) Circular RNA\_ANKIB1 accelerates chemo-resistance of osteosarcoma via binding microRNA-26b-5p and modulating enhancer of zeste homolog 2. Bioengineered 13:7351-7366. doi: 10.1080/21655979.2022.2037869

167. Jacques C, Calleja LR, Baud'huin M, Quillard T, Heymann D, Lamoureux F and Ory B (2016) miRNA-193a-5p repression of p73 controls Cisplatin chemoresistance in primary bone tumors. Oncotarget 7:54503-54514. doi: 10.18632/oncotarget.10950

168. Nakatani F, Ferracin M, Manara MC, Ventura S, del Monaco V, Ferrari S, Alberghini M, Grilli A, Knuutila S, Schaefer K-L, Mattia G, Negrini M, Picci P, Serra M and Scotlandi K (2012) miR-34a predicts survival of Ewing's sarcoma patients and directly influences cell chemo-sensitivity and malignancy. The Journal of Pathology 226:796-805. doi: 10.1002/path.3007

169. Robin TP, Smith A, McKinsey E, Reaves L, Jedlicka P and Ford HL (2012) EWS/FLI1 Regulates EYA3 in Ewing Sarcoma via Modulation of miRNA-708, Resulting in Increased Cell Survival and Chemoresistance. Molecular Cancer Research 10:1098-1108. doi: 10.1158/1541-7786.Mcr-12-0086

170. Iida K, Fukushi J-i, Matsumoto Y, Oda Y, Takahashi Y, Fujiwara T, Fujiwara-Okada Y, Hatano M, Nabashima A, Kamura S and Iwamoto Y (2013) miR-125b develops chemoresistance in Ewing sarcoma/primitive neuroectodermal tumor. Cancer Cell International 13. doi: 10.1186/1475-2867-13-21

171. Zhu Z, Wang CP, Zhang YF and Nie L (2014) MicroRNA-100 resensitizes resistant chondrosarcoma cells to cisplatin through direct targeting of mTOR. Asian Pac J Cancer Prev 15:917-23. doi: 10.7314/apjcp.2014.15.2.917

172. Huang K, Chen J, Yang MS, Tang YJ and Pan F (2017) Inhibition of Src by microRNA-23b increases the cisplatin sensitivity of chondrosarcoma cells. Cancer Biomark 18:231-239. doi: 10.3233/CBM-160102

173. Tang XY, Zheng W, Ding M, Guo KJ, Yuan F, Feng H, Deng B, Sun W, Hou Y and Gao L (2016) miR-125b acts as a tumor suppressor in chondrosarcoma cells by the sensitization to doxorubicin through direct targeting the ErbB2-regulated glucose metabolism. Drug Des Devel Ther 10:571-83. doi: 10.2147/DDDT.S90530

174. Bharathy N, Berlow NE, Wang E, Abraham J, Settelmeyer TP, Hooper JE, Svalina MN, Ishikawa Y, Zientek K, Bajwa Z, Goros MW, Hernandez BS, Wolff JE, Rudek MA, Xu L, Anders NM, Pal R, Harrold AP, Davies AM, Ashok A, Bushby D, Mancini M, Noakes C, Goodwin NC, Ordentlich P, Keck J, Hawkins DS, Rudzinski ER, Chatterjee B, Bachinger HP, Barr FG, Liddle J, Garcia BA, Mansoor A, Perkins TJ, Vakoc CR, Michalek JE and Keller C (2018) The HDAC3-SMARCA4-miR-27a axis promotes expression of the PAX3:FOXO1 fusion oncogene in rhabdomyosarcoma. Sci Signal 11. doi: 10.1126/scisignal.aau7632

175. Minami Y, Kohsaka S, Tsuda M, Yachi K, Hatori N, Tanino M, Kimura T, Nishihara H, Minami A, Iwasaki N and Tanaka S (2014) SS

 18‐

 SSX

 ‐regulated miR‐17 promotes tumor growth of synovial sarcoma by inhibiting p21

 WAF

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 1. Cancer Science 105:1152-1159. doi: 10.1111/cas.12479

176. Xu Y, Cheng M, Mi L, Qiu Y, Hao W and Li L (2018) Mir-22-3p Enhances the Chemosensitivity of Gastrointestinal Stromal Tumor Cell Lines to Cisplatin through PTEN/PI3K/Akt Pathway. Iranian journal of allergy, asthma, and immunology 17:318-325. doi: 10.18502/ijaai.v17i4.91

177. Zhang Z, Sun C, Li C, Jiao X, Griffin BB, Dongol S, Wu H, Zhang C, Cao W, Dong R, Yang X, Zhang Q and Kong B (2020) Upregulated MELK Leads to Doxorubicin Chemoresistance and M2 Macrophage Polarization via the miR-34a/JAK2/STAT3 Pathway in Uterine Leiomyosarcoma. Front Oncol 10:453. doi: 10.3389/fonc.2020.00453

178. Jain N, Das B and Mallick B (2022) miR-197-5p increases Doxorubicin-mediated anticancer cytotoxicity of HT1080 fibrosarcoma cells by decreasing drug efflux. DNA Repair (Amst) 109:103259. doi: 10.1016/j.dnarep.2021.103259

179. Li D, Zhao K, Zhao Z, Jiang B, Gong X, Zhang Y, Guo Y, Xiao H, Wang Y, Liu H, Yi C and Gu W (2021) High Expression MicroRNA-206 Inhibits the Growth of Tumor Cells in Human Malignant Fibrous Histiocytoma. Front Cell Dev Biol 9:751833. doi: 10.3389/fcell.2021.751833

180. Wang JH, Zeng Z, Sun J, Chen Y and Gao X (2021) A novel small-molecule antagonist enhances the sensitivity of osteosarcoma to cabozantinib in vitro and in vivo by targeting DNMT-1 correlated with disease severity in human patients. Pharmacol Res 173:105869. doi: 10.1016/j.phrs.2021.105869

181. Wang L, En H, Yang L, Zhang Y, Sun B and Gao J (2019) miR-596 suppresses the expression of Survivin and enhances the sensitivity of osteosarcoma cells to the molecular targeting agent anlotinib. Onco Targets Ther 12:6825-6838. doi: 10.2147/OTT.S215145

182. Wang T, Wang D, Zhang L, Yang P, Wang J, Liu Q, Yan F and Lin F (2019) The TGFbeta-miR-499a-SHKBP1 pathway induces resistance to EGFR inhibitors in osteosarcoma cancer stem cell-like cells. J Exp Clin Cancer Res 38:226. doi: 10.1186/s13046-019-1195-y

183. Cao K, Li M, Miao J, Lu X, Kang X, Zhu H, Du S, Li X, Zhang Q, Guan W, Dong Y and Xia X (2018) CCDC26 knockdown enhances resistance of gastrointestinal stromal tumor cells to imatinib by interacting with c-KIT. American journal of translational research 10:274-282.

184. Yan J, Chen D, Chen X, Sun X, Dong Q, Hu C, Zhou F and Chen W (2019) Downregulation of lncRNA CCDC26 contributes to imatinib resistance in human gastrointestinal stromal tumors through IGF-1R upregulation. Braz J Med Biol Res 52:e8399. doi: 10.1590/1414-431x20198399

185. Zhang J, Chen K, Tang Y, Luan X, Zheng X, Lu X, Mao J, Hu L, Zhang S, Zhang X and Chen W (2021) LncRNA-HOTAIR activates autophagy and promotes the imatinib resistance of gastrointestinal stromal tumor cells through a mechanism involving the miR-130a/ATG2B pathway. Cell Death Dis 12:367. doi: 10.1038/s41419-021-03650-7

186. Shao Y, Lian S, Zheng J, Tong H, Wang J, Xu J, Liu W, Hu G, Zhang Y and He J (2021) RP11-616M22.7 recapitulates imatinib resistance in gastrointestinal stromal tumor. Mol Ther Nucleic Acids 25:264-276. doi: 10.1016/j.omtn.2021.05.017

187. Fan R, Zhong J, Zheng S, Wang Z, Xu Y, Li S, Zhou J and Yuan F (2015) microRNA-218 increase the sensitivity of gastrointestinal stromal tumor to imatinib through PI3K/AKT pathway. Clin Exp Med 15:137-44. doi: 10.1007/s10238-014-0280-y

188. Chen W, Li Z, Liu H, Jiang S, Wang G, Sun L, Li J, Wang X, Yu S, Huang J and Dong Y (2020) MicroRNA-30a targets BECLIN-1 to inactivate autophagy and sensitizes gastrointestinal stromal tumor cells to imatinib. Cell Death & Disease 11. doi: 10.1038/s41419-020-2390-7

189. Shi Y, Gao X, Hu Q, Li X, Xu J, Lu S, Liu Y, Xu C, Jiang D, Lin J, Xue A, Tan Y, Shen K and Hou Y (2016) PIK3C2A is a gene-specific target of microRNA-518a-5p in imatinib mesylate-resistant gastrointestinal stromal tumor. Laboratory Investigation 96:652-660. doi: 10.1038/labinvest.2015.157

190. Huang WK, Akcakaya P, Gangaev A, Lee L, Zeljic K, Hajeri P, Berglund E, Ghaderi M, Ahlen J, Branstrom R, Larsson C and Lui WO (2018) miR-125a-5p regulation increases phosphorylation of FAK that contributes to imatinib resistance in gastrointestinal stromal tumors. Exp Cell Res 371:287-296. doi: 10.1016/j.yexcr.2018.08.028

191. Akcakaya P, Caramuta S, Ahlen J, Ghaderi M, Berglund E, Ostman A, Branstrom R, Larsson C and Lui WO (2014) microRNA expression signatures of gastrointestinal stromal tumours: associations with imatinib resistance and patient outcome. Br J Cancer 111:2091-102. doi: 10.1038/bjc.2014.548

192. Cao CL, Niu HJ, Kang SP, Cong CL and Kang SR (2016) miRNA-21 sensitizes gastrointestinal stromal tumors (GISTs) cells to Imatinib via targeting B-cell lymphoma 2 (Bcl-2). European review for medical and pharmacological sciences 20:3574-3581.

193. Shiozawa K, Shuting J, Yoshioka Y, Ochiya T and Kondo T (2018) Extracellular vesicle-encapsulated microRNA-761 enhances pazopanib resistance in synovial sarcoma. Biochem Biophys Res Commun 495:1322-1327. doi: 10.1016/j.bbrc.2017.11.164

194. Pang B and Hao Y (2021) Integrated Analysis of the Transcriptome Profile Reveals the Potential Roles Played by Long Noncoding RNAs in Immunotherapy for Sarcoma. Frontiers in oncology 11:690486. doi: 10.3389/fonc.2021.690486

195. He P, Xu YQ, Wang ZJ and Sheng B (2020) LncRNA LINC00210 regulated radiosensitivity of osteosarcoma cells via miR-342-3p/GFRA1 axis. J Clin Lab Anal 34:e23540. doi: 10.1002/jcla.23540

196. Yang Z, Wa Q-D, Lu C, Pan W, Lu Z-Μ and Ao J (2018) miR‑328‑3p enhances the radiosensitivity of osteosarcoma and regulates apoptosis and cell viability via H2AX. Oncology reports 39:545-553. doi: 10.3892/or.2017.6112

197. Li Y, Song X, Liu Z, Li Q, Huang M, Su B, Mao Y, Wang Y, Mo W and Chen H (2019) Upregulation of miR-214 Induced Radioresistance of Osteosarcoma by Targeting PHLDA2 via PI3K/Akt Signaling. Front Oncol 9:298. doi: 10.3389/fonc.2019.00298

198. Dai N, Qing Y, Cun Y, Zhong Z, Li C, Zhang S, Shan J, Yang X, Dai X, Cheng Y, Xiao H, Xu C, Li M and Wang D (2018) miR-513a-5p regulates radiosensitivity of osteosarcoma by targeting human apurinic/apyrimidinic endonuclease. Oncotarget 9:25414-25426. doi: 10.18632/oncotarget.11003

199. Vares G, Ahire V, Sunada S, Ho Kim E, Sai S, Chevalier F, Romeo P-H, Yamamoto T, Nakajima T and Saintigny Y (2020) A multimodal treatment of carbon ions irradiation, miRNA-34 and mTOR inhibitor specifically control high-grade chondrosarcoma cancer stem cells. Radiotherapy and Oncology 150:253-261. doi: 10.1016/j.radonc.2020.07.034

200. Lee YY, Yang YP, Huang MC, Wang ML, Yen SH, Huang PI, Chen YW, Chiou SH, Lan YT, Ma HI, Shih YH and Chen MT (2014) MicroRNA142-3p promotes tumor-initiating and radioresistant properties in malignant pediatric brain tumors. Cell Transplant 23:669-90. doi: 10.3727/096368914X678364

201. Polvani S, Martignano F, Scoccianti G, Pasqui A, Palomba AR, Conticello S, Galli A, Palchetti I, Caporalini C, Antonuzzo L, Campanacci DA and Pillozzi S (2022) Growth arrest-specific 5 lncRNA as a valuable biomarker of chemoresistance in osteosarcoma. Anticancer Drugs 33:278-285. doi: 10.1097/CAD.0000000000001263

202. Zhu K-P, Zhang C-L, Shen G-Q and Zhu Z-S (2015) Long noncoding RNA expression profiles of the doxorubicin-resistant human osteosarcoma cell line MG63/DXR and its parental cell line MG63 as ascertained by microarray analysis. International journal of clinical and experimental pathology 8:8754-8773.

203. Yuan J, Chen L, Chen X, Sun W and Zhou X (2012) Identification of serum microRNA-21 as a biomarker for chemosensitivity and prognosis in human osteosarcoma. The Journal of international medical research 40:2090-2097.

204. Luo Z, Liu M, Zhang H and Xia Y (2016) Association of circulating miR-125b and survival in patients with osteosarcoma–A single center experience. Journal of Bone Oncology 5:167-172. doi: 10.1016/j.jbo.2016.06.002

205. Han J, Ye Z, Kong Q, Wu F, Wang G and Wang K (2020) Circular RNA expression pattern in cisplatin-resistant osteosarcoma cells. Transl Cancer Res 9:262-270. doi: 10.21037/tcr.2019.12.80

206. Kun-Peng Z, Xiao-Long M, Lei Z, Chun-Lin Z, Jian-Ping H and Tai-Cheng Z (2018) Screening circular RNA related to chemotherapeutic resistance in osteosarcoma by RNA sequencing. Epigenomics 10:1327-1346. doi: 10.2217/epi-2018-0023

207. Yamada H, Takahashi M, Watanuki M, Watanabe M, Hiraide S, Saijo K, Komine K and Ishioka C (2021) lncRNA HAR1B has potential to be a predictive marker for pazopanib therapy in patients with sarcoma. Oncology Letters 21. doi: 10.3892/ol.2021.12716

208. Yan J, Chen D, Chen X, Sun X, Dong Q, Du Z and Wang T (2018) Identification of imatinib‑resistant long non‑coding RNAs in gastrointestinal stromal tumors. Oncology Letters. doi: 10.3892/ol.2018.9821

209. Amirnasr, Gits, van K, Smid, Vriends, Rutkowski, Sciot, Schöffski, Debiec R, Sleijfer and Wiemer (2019) Molecular Comparison of Imatinib-Naïve and Resistant Gastrointestinal Stromal Tumors: Differentially Expressed microRNAs and mRNAs. Cancers 11. doi: 10.3390/cancers11060882

210. Kou Y, Yang R and Wang Q (2018) Serum miR-518e-5p is a potential biomarker for secondary imatinib-resistant gastrointestinal stromal tumor. Journal of biosciences 43:1015-1023.

211. Gao X, Shen K, Wang C, Ling J, Wang H, Fang Y, Shi Y, Hou Y, Qin J, Sun Y and Qin X (2014) MiR-320a downregulation is associated with imatinib resistance in gastrointestinal stromal tumors. Acta Biochim Biophys Sin (Shanghai) 46:72-5. doi: 10.1093/abbs/gmt118

212. Zhang Z, Jiang Ny, Guan Ry, Zhu Yk, Jiang Fq and Piao D (2018) Identification of critical microRNAs in gastrointestinal stromal tumor patients treated with Imatinib. Neoplasma 65:683-692. doi: 10.4149/neo\_2018\_170906N575