

FOXM1在胃癌中的研究进展

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Title: Research progress of FOXM1 in gastric cancer

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摘要: FOXM1 已成为广泛认可的促癌转录因子, 在多种实体肿瘤中表达增高, 与肿瘤增殖、侵袭、转移密切相关。胃癌是一种发病率及死亡率都很高的恶性肿瘤, 通过深入研究FOXM1在胃癌发生发展中的作用机制, 可望成为胃癌治疗的新靶点。

Abstract: FOXM1 has become a widely recognized cancer-promoting transcription factor, which is highly expressed in various solid tumors and is closely related to tumor proliferation, invasion and metastasis. Gastric cancer is a malignant tumor with high morbidity and mortality. Through in-depth study of the mechanism of action of FOXM1 in the development of gastric cancer, it will become a new target for the treatment of gastric cancer in the future.

参考文献/REFERENCES

- [1] Myatt SS,Lam EW.The emerging roles of forkhead box (Fox) proteins in cancer [J].Nat Rev Cancer,2007,7(11):847-859.
- [2] Hannenhalli S,Kaestner KH.The evolution of Fox genes and their role in development and disease [J].Nat Rev Genet,2009,10(4):233-240.
- [3] Zhang WT,Duan N,Song T,et al.The emerging roles of Forkhead Box (FOX) proteins in osteosarcoma [J].J Cancer,2017,8(9):1619-1628.
- [4] Korver W,Roose J,Clevers H.The winged-helix transcription factor Trident is expressed in cycling cells [J].Nucleic Acids Res,1997,25(9):1715-1719.
- [5] Korver W,Roose J,Heinen K,et al.The human TRIDENT/HFH-11/FKHL16 gene:structure,localization, and promoter characterization [J].Genomics,1997,46(3):435-442.
- [6] Yao KM,Sha M,Lu Z,et al.Molecular analysis of a novel winged helix protein,WIN.Expression pattern,DNA binding property, and alternative splicing within the DNA binding domain [J].J Biol Chem,1997,272(32):19827-19836.
- [7] Lüscher-Firzlaff JM,Westendorf JM,Zwicker J,et al.Interaction of the fork head domain transcription factor MPP2 with the human papilloma virus 16 E7 protein:Enhancement of transformation and transactivation [J].Oncogene,1999,18(41):5620-5630.
- [8] Carlsson P,Mahlapuu M.Forkhead transcription factors:Key players in development and metabolism [J].Dev Biol,2002,250(1):1-23.
- [9] Kelleher FC,O'Sullivan H.FOXM1 in sarcoma:Role in cell cycle,pluripotency genes and stem cell pathways [J].Oncotarget,2016,7(27):42792-42804.
- [10] Wierstra I,Alves J.FOXM1,a typical proliferation-associated transcription factor [J].Biol Chem,2007,388(12):1257-1274.
- [11] Liu XH,Yang Q.Research progress of FOXM1 in ovarian cancer [J].Modern Oncology,2017,25(19):3184-3187. [刘鑫慧,杨清.FOXM1在卵巢癌中的研究进展 [J].现代肿瘤医学,2017,25(19):3184-3187.]

- [12] Park HJ,Wang Z,Costa RH,et al.An N-terminal inhibitory domain modulates activity of FoxM1 during cell cycle [J].Oncogene,2008,27(12):1696-1704.
- [13] Laoukili J,Alvarezfernandez M,Stahl M,et al.FoxM1 is degraded at mitotic exit in a Cdh1-dependent manner [J].Cell Cycle,2008,7(17):2720-2726.
- [14] Lv C,Zhao G,Sun X,et al.Acetylation of FOXM1 is essential for its transactivation and tumor growth stimulation [J].Oncotarget,2016,7(37):60366-60382.
- [15] Laoukili J,Stahl M,Medema RH.FoxM1:At the crossroads of ageing and cancer [J].Biochim Biophys Acta,2007,1775(1):92-102.
- [16] Yang DK,Son CH,Lee SK,et al.Forkhead box M1 expression in pulmonary squamous cell carcinoma:correlation with clinicopathologic features and its prognostic significance [J].Hum Patholo,2009,40(4):464-470.
- [17] Wonsey DR,Follettie MT.Loss of the forkhead transcription factor FoxM1 causes centrosome amplification and mitotic catastrophe [J].Cancer Res,2005,65(12):5181-5189.
- [18] Zeng JP,Wang LX,Li Q,et al.FoxM1 is up-regulated in gastric cancer and its inhibition leads to cellular senescence,partially dependent on p27 kip1 [J].J Pathol,2010,218(4):419-427.
- [19] Furukawa Y,Obama K,Ura K,et al.Genome-wide analysis of gene expression in human intrahepatic cholangiocellular carcinomas [J].Cancer Res,2005,65(6):1339-1348.
- [20] Chan DW,Yu SY,Chiu PM,et al.Over-expression of FOXM1 transcription factor is associated with cervical cancer progression and pathogenesis [J].J Pathol,2008,215(3):245-252.
- [21] Chandran UR,Ma C,Dhir R,et al.Gene expression profiles of prostate cancer reveal involvement of multiple molecular pathways in the metastatic process [J].BMC Cancer,2007,7(1):64.
- [22] Wen N,Wang Y,Wen L,et al.Overexpression of FOXM1 predicts poor prognosis and promotes cancer cell proliferation,migration and invasion in epithelial ovarian cancer [J].J Transl Med,2014,12(1):134.
- [23] Wang F,Sun GP,Zou YF,et al.MicroRNAs as promising biomarkers for gastric cancer [J].Cancer Biomark,2012,11(6):259-267.
- [24] Cervantes A,Roda D,Tarazona N,et al.Current questions for the treatment of advanced gastric cancer [J].Cancer Treat Rev,2013,39(1):60-67.
- [25] Zheng L,Pu J,Qi T,et al.miRNA-145 targets v-ets erythroblastosis virus E26 oncogene homolog 1 to suppress the invasion,metastasis, and angiogenesis of gastric cancer cells [J].Mol Cancer Res,2013,11(2):182-193.
- [26] Jiang D,Jiang L,Liu B,et al.Clinicopathological and prognostic significance of FoxM1 in gastric cancer:A meta-analysis [J].Int J Surg,2017,48:38-44.
- [27] Zhang Y,Chai YX,Han Y,et al.The expression and clinical significance of FOXM1 in gastric cancer tissues [J].Advances in Modern Chinese General Surgery,2015,18(10):827-829. [张怡,柴宇啸,韩毓,等.FOXM1在胃癌组织中的表达及临床意义 [J].中国现代普通外科进展,2015,18(10):827-829.]
- [28] Wang Y,Zeng J,Pan J,et al.miR-320a inhibits gastric carcinoma by targeting activity in the FoxM1-P27KIP1 axis [J].Oncotarget,2016,7(20):29275-29286.
- [29] Wang L,Bo X,Zheng Q,et al.Paired box 8 suppresses tumor angiogenesis and metastasis in gastric cancer through repression of FOXM1 via induction of microRNA-612 [J].J Exp Clin Cancer Res,2018,37(1):159.
- [30] Xiang Q,Tan G,Jiang X,et al.Suppression of FOXM1 transcriptional activities via a single-stranded DNA aptamer generated by SELEX [J].Sci Rep,2017,7:45377.
- [31] Cai H,Ye X,He B,et al.LncRNA-AP001631.9 promotes cell migration in gastric cancer [J].Int J Clin Exp Pathol,2015,8(6):6235-6244.
- [32] Zhang Y,Ye X,Chen L,et al.PARI functions as a new transcriptional target of FOXM1 involved in gastric cancer development [J].Int J Biol Sci,2018,14(5):531-541.
- [33] Jiang W,Zhou F,Li N,et al.FOXM1-LDHA signaling promoted gastric cancer glycolytic phenotype and progression [J].Int J Clin Exp Pathol,2015,8(6):6756-6763.
- [34] De CB,Berk G.Regulatory networks defining EMT during cancer initiation and progression [J].Nat Rev Cancer,2013,13(2):97-110.
- [35] Yang J,Mani SA,Weinberg RA.Exploring a new twist on tumor metastasis [J].Cancer Res,2006,66(9):4549-4552.
- [36] Horikawa T,Yang J,Kondo S,et al.Twist and epithelial-mesenchymal transition are induced by the EBV oncoprotein latent membrane protein 1 and are associated with metastatic nasopharyngeal carcinoma [J].Cancer Res,2007,67(5):1970-1978.
- [37] Qian J,Luo Y,Gu X,et al.Twist1 promotes gastric cancer cell proliferation through up-regulation of FoxM1 [J].PLoS One,2013,8(10):e77625.
- [38] Yang L,Cui M,Zhang L,et al.FOXM1 facilitates gastric cancer cell migration and invasion by inducing Cathepsin D [J].Oncotarget,2017,8(40):68180-68190.
- [39] Bhat UG,Halasi M,Gartel AL.FoxM1 is a general target for proteasome inhibitors [J].PLoS One,2009,4(8):e6593.
- [40] Bhat UG,Halasi M,Gartel AL.Thiazole antibiotics target FoxM1 and induce apoptosis in human cancer cells [J].PLoS One,2009,4(5):e5592.
- [41] Jiang L,Wang P,Chen L,et al.Down-regulation of FoxM1 by thiostrepton or small interfering RNA inhibits proliferation,transformation ability and angiogenesis, and induces apoptosis of nasopharyngeal carcinoma cells [J].Int J Clin Exp Pathol,2014,7(9):5450-5460.
- [42] Gusarov GA,Wang IC,Major ML,et al.A cell-penetrating ARF peptide inhibitor of FoxM1 in mouse

- hepatocellular carcinoma treatment [J] .J Clin Invest,2007,117(1):99-111.
- [43] Jiao Y,Wang X,Li Y,et al.Tanshinone IIA suppresses gastric cancer cell proliferation and migration by downregulation of FOXM1 [J] .Oncol Rep,2017,37(3):1394-1400.
- [44] Li X,Qiu W,Liu B,et al.Forkhead box transcription factor 1 expression in gastric cancer:FOXM1 is a poor prognostic factor and mediates resistance to docetaxel [J] .J Transl Med,2013,11(1):204.
- [45] Tian L,Zhao Z,Xie L,et al.MiR-361-5p suppresses chemoresistance of gastric cancer cells by targeting FOXM1 via the PI3K/Akt/mTOR pathway [J] .Oncotarget,2018,9(4):4886-4896.
- [46] Moraes GND,Bella L,Zona S,et al.Insights into a critical role of the FOXO3a-FOXM1 axis in DNA damage response and genotoxic drug resistance [J] .Curr Drug Targets,2016,17(2):164-177.
- [47] Han S,Ma X,Zhao Y,et al.Identification of Glypican-3 as a potential metastasis suppressor gene in gastric cancer [J] .Oncotarget,2016,7(28):44406-44416.

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