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Mini Review

Usp22 in leukemia: a historial review

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Abstract

USP22 is a deubiquitinase that belongs to the ubiquitin-specific peptidase (USP) family and it has been shown to play an important role in the epigenetic regulation of many types of cancer. In this review I will mention the available publications regarding the role of USP22 in leukemia. More general and/or exhaustive reviews will be cited in other to help the reader to expand the knowledge about USP22 function.

INTRODUCTION

USP22 as an oncogene

USP22 is considered an oncogene in most cancer types (1). It has been shown to be part of the SAGA coactivator complex, which is an activator of transcription in eukaryotes (2). USP22 erases mono-ubiquitination of histone H2B (H2Bub1) and the lost of this epigenetic mark is frequently associated with poor prognosis in a wide range of human cancers (3).

USP22 in leukemia

Despite its well-accepted role in carcinogenesis, literature regarding USP22 in leukemia is scarce, whereas publications about USP22 function in other blood malignancies, i.e. lymphoma and myeloma, are absent.

In a study about B-acute lymphoblastic leukemia, transplantation of B-acute lymphoblastic leukemia cells from patients where CD9 had been depleted into immunodeficient mice resulted in extended survival of mice and diminished expression of USP22 at the protein level. In addition, the authors suggested a role of CD9 and, subsequently, USP22, in cancer stem cells (4). Furthermore, in acute myeloid leukemia, USP22 was found to be downstream and induced by c-MYC, thereby promoting maintenance and drug resistance of human acute myeloid leukemia stem cells (5).

When USP22 was depleted in a genetic mouse model of juvenile myelomonocytic leukemia generated by oncogenic mutation in *ras* gene, disease was exhacerbated and mice lifespan was shortened, probably due to myeloid cell differentiation blockage and subsequent promotion of leukemia (6).

Regarding acute myeloid leukemia, ring finger protein 220 (RNF220) was found to correlate with bad prognosis. An increase in USP22 protein levels, as well as in Cyclin D1 protein levels accompanied by a decrease in Cyclin D1 ubiquitylation levels was detected in bone marrow cells of acute myeloid leukemia where RNF220 was overexpressed and, after further analysis, the authors concluded that RNF220 enhances Cyclin D1 protein stability via USP22 (7).

CONCLUSIONS AND FURTHER DIRECTIONS

Further research is needed to deeply explore the role of USP22 in blood malignancies, including all the existing subtypes of leukemia, lymphoma and myeloma, since USP22 is a promising targetable epigenetic enhancer of tumorigenesis, mainly through its activity on histone H2B (8).

REFERENCES

1. Feng, Tingting, Sunbin Ling, Chenyang Xu, Lisha Ying, et al. Ubiquitin-Specific Peptidase 22 in Cancer. Cancer Lett. 2021;514: 30-37.
2. Stanek, Timothy J, Victoria J Gennaro, Mason A Tracewell, Daniela Di Marcantonio, et al. 2021. The SAGA Complex Regulates Early Steps in Transcription via Its Deubiquitylase Module Subunit USP22. EMBO J. 2021; 40: e102509.
3. Zhou Sa, Yuqiao Cai, Xinyi Liu, Lijun Jin, Xiaoqin Wang, et al. Role of H2B Mono-Ubiquitination in the Initiation and Progression of Cancer. Bull Cancer. 2021;108: 385–398.
4. Yamazaki, Hiroto, Wilson Xu, Motohiko Naito, Hiroko Nishida, et al. Regulation of Cancer Stem Cell Properties by CD9 in Human B-Acute Lymphoblastic Leukemia. Biochem Biophys Res Commun. 2011; 409: 14-21.
5. Li, Ling, Tereza Osdal, Yinwei Ho, Sookhee Chun, et al. SIRT1 Activation by a C-MYC Oncogenic Network Promotes the Maintenance and Drug Resistance of Human FLT3-ITD Acute Myeloid Leukemia Stem Cells. Cell Stem Cell. 2014; 15: 431–446.

6. J Melo-Cardenas, Xu Y, Wei J, Tan C, Kong S, et al. USP22 Deficiency Leads to Myeloid Leukemia upon Oncogenic Kras Activation through a PU.1-Dependent Mechanism. Blood. 2018; 132: 423–434.

7. Pan, Yuming, Na An, Xiaopeng Deng, Qiaoxia Zhang, et al. RNF220 Promotes the Proliferation of Leukaemic Cells and Reduces the Degradation of the Cyclin D1 Protein through USP22. Blood Cells Mol Dis. 2021;86:102490.

8. Marsh, Deborah J, Yue Ma, Kristie Ann Dickson. Histone Monoubiquitination in Chromatin Remodelling: Focus on the Histone H2b Interactome and Cancer. Cancers. 2020; 12: 1–24.

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