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The Role of PRAME in Malignant Melanoma: From Biomarker to Therapeutic Target

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Abstract

Malignant melanoma, a highly aggressive form of skin cancer originating from melanocytes, presents challenges in clinical management due to its propensity for metastasis and therapy resistance. Preferentially Expressed Antigen in Melanoma (PRAME) has recently emerged as a promising candidate for both diagnosis and therapy in malignant melanoma. This review explores PRAME's involvement in malignant melanoma pathogenesis, its role as a diagnostic and prognostic biomarker, and its potential as a therapeutic target.

Keywords: Malignant melanoma; PRAME; Biomarker; Diagnosis; Prognosis; Therapeutic target.

Introduction

The global rise in malignant melanoma incidence necessitates a deeper understanding of its molecular basis for improved patient outcomes. PRAME, initially identified as a melanoma-associated antigen [1], has garnered attention for its implications in cancer progression and therapeutic intervention. This review aims to delineate PRAME's multifaceted roles in malignant melanoma and its implications for clinical management.

PRAME in malignant melanoma pathogenesis

PRAME exhibits diverse roles in malignant melanoma pathogenesis, impacting proliferation, invasion, metastasis, and immune evasion [2]. Dysregulated PRAME expression promotes tumour growth by modulating critical signalling pathways like MAPK and PI3K/AKT, bolstering cell survival and proliferation [3]. Additionally, PRAME overexpression correlates with heightened metastatic potential and apoptosis resistance, driving malignant melanoma progression [4].

Diagnostic and prognostic utility of PRAME

PRAME's distinct expression in malignant melanoma versus normal tissue renders it a valuable diagnostic marker [5]. Immunohistochemical PRAME detection aids in distinguishing malignant melanoma from benign lesions and assessing disease severity. Elevated PRAME expression also serves as a prognostic indicator, correlating with advanced tumour stage, heightened metastatic risk, and poorer clinical outcomes [6].

Hence, PRAME holds promise as a prognostic biomarker for risk stratification and treatment planning in malignant melanoma.

PRAME as a therapeutic target

Targeting PRAME presents a promising therapeutic avenue for malignant melanoma. Diverse approaches, including immunotherapy and small molecule inhibitors, aim to inhibit PRAME expression or function. Immunotherapeutic strategies like PRAME-specific T cell-based therapies and PRAME-targeting vaccines have shown efficacy in preclinical and clinical studies, inducing potent anti-tumour immune responses and tumour regression [7]. Additionally, small molecule inhibitors targeting PRAME-associated pathways offer potential for combination therapies to enhance treatment efficacy and overcome resistance mechanisms [8].

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Future perspectives

Despite significant strides, several challenges persist in realising PRAME's therapeutic potential in malignant melanoma. Further research is warranted to elucidate PRAME-mediated oncogenesis and resistance mechanisms. Moreover, optimising treatment strategies and identifying predictive biomarkers of treatment response are crucial for advancing PRAME-targeted therapies in clinical practice [9].

Conclusion

PRAME emerges as a promising biomarker and therapeutic target in malignant melanoma, offering avenues for improved diagnosis, prognostication, and treatment. Its pivotal roles in driving disease progression underscore its significance in malignant melanoma pathogenesis. Continued research efforts to unravel PRAME biology and develop effective targeted therapies hold promise for enhancing outcomes in malignant melanoma patients.

Declarations

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