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Management of triple-negative breast cancer by natural compounds through different mechanistic pathways

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Triple-negative breast cancer (TNBC) is the most severe form of breast cancer, characterized by the loss of estrogen, progesterone, and human epidermal growth factor receptors. It is caused by various genetic and epigenetic factors, resulting in poor prognosis. Epigenetic changes, such as DNA methylation and histone modification, are the leading mechanisms responsible for TNBC progression and metastasis. This review comprehensively covers the various subtypes of TNBC and their epigenetic causes. In addition, the genetic association of TNBC with all significant genes and signaling pathways linked to the progression of this form of cancer has been enlisted. Furthermore, the possible uses of natural compounds through different mechanistic pathways have also been discussed in detail for the successful management of TNBC.

KEYWORDS

DNA methylation, genes, histone modification, natural drugs, TNBC, epigenetic mechanisms

1 Introduction

Cancer is characterized by an uncontrolled growth of the body's cells (Kaleem et al., 2022; Chunarkar-patil et al., 2024). Several genetic and epigenetic factors have been suggested to be responsible for the development of various types of cancer, resulting in the switch-off/on the tumor suppressor genes. Epigenetics involves studying the mechanisms that can change gene expression without affecting DNA sequence (Füllgrabe et al., 2011; Reddy Dachani et al., 2024). Several epigenetic modifications, such as histone acetylation and DNA methylation, are responsible for cancer development (Kaleem et al., 2021a; Kaleem et al., 2021b).