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LETTER TO THE EDITOR

Exploring the Therapeutic Potential of Talasteroid: A Marine-Derived Withanolide from *Talaromyces stollii* for Breast Cancer Treatment

Dear Editor,

Talasteroid, a withanolide derived from the marine fungus *Talaromyces stollii* (Pathak et al., 2024), presents an exciting prospect for breast cancer treatment due to its potential cytotoxic, anti-proliferative, and apoptosis-inducing properties. Withanolides are well known for their ability to modulate various signaling pathways involved in cancer progression (Palliyaguru et al., 2016), and talasteroid may act through multiple mechanisms, including inhibition of the PI3K-AKT-mTOR pathway, which is frequently dysregulated in breast cancer (Figure 1). By targeting this pathway, talasteroid could induce apoptosis, suppress tumor growth, and prevent metastasis. Additionally, its structural similarity to other steroidal lactones suggests potential interactions with estrogen receptors (ER), making it a promising candidate for hormone-dependent breast cancers, particularly ER-positive subtypes.

Another potential mechanism of talasteroid involves disrupting epithelial-to-mesenchymal transition (EMT), a key process in cancer metastasis. By inhibiting EMT-related transcription factors such as Snail, Twist, and ZEB1, talasteroid could reduce breast cancer cell migration and invasion. Furthermore, its ability to enhance reactive oxygen species (ROS) production within cancer cells might trigger oxidative stress-induced cell death, a mechanism often leveraged in anticancer therapies. The immunomodulatory effects of withanolides also suggest that talasteroid could activate immune responses against breast tumors, possibly by enhancing natural killer (NK) cell activity or modulating the tumor microenvironment.

In terms of future applications, talasteroid could be explored as a combinational therapy with existing chemotherapeutic agents to enhance efficacy and reduce drug resistance. Encapsulation into nanoparticle-based drug delivery systems may improve its bioavailability, allowing for targeted delivery to breast cancer cells while minimizing systemic toxicity. Moreover, structural modifications of talasteroid could optimize its pharmacokinetic properties, making it more suitable for clinical use. Preclinical studies and in vivo models will be crucial in determining its safety and efficacy, paving the way for potential clinical trials. If successful, talasteroid could serve as a novel marine-derived therapeutic agent, expanding the arsenal of natural product-based drugs for breast cancer treatment.

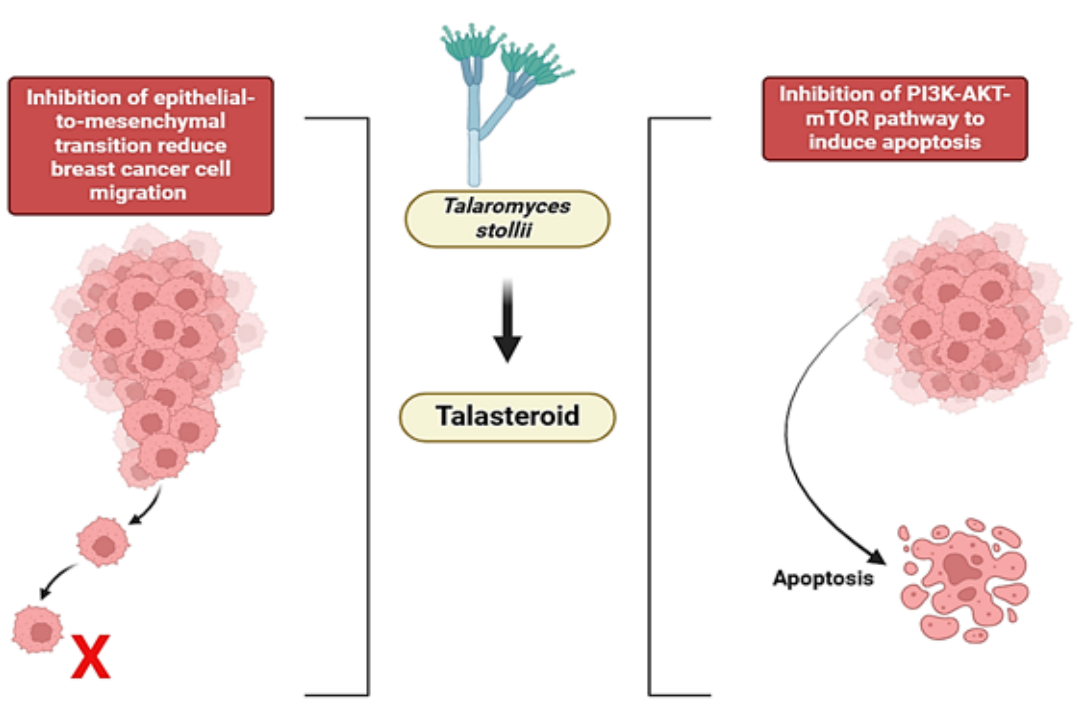

Figure 1: Graphical presentation of the possible therapeutic potential of talasteriod on breast cancer.

Declarations

Ethics approval statement

No ethical approval was required for the current study as it did not deal with any human or animal samples.

Consent to participate

Not applicable

Consent to publish

Not applicable

Data Availability Statement

The data are available from the corresponding author upon reasonable request

Competing Interests

The authors declare that they have no conflict of interest

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Author contribution

S.B: Conceptualization, Writing and Reviewing draft, Investigation, Project administration, and Supervision

Reference

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***Corresponding Author:** Sarubala Balasubramanian
Department of Biochemistry, SRM Arts and Science College, Kattankulathur-603203, Chengalpet District, Tamil Nadu, India
Email: sarubala777@gmail.com

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