Yeast β-Glucan

A Promising Avenue in Cancer Treatment

Cancer remains a leading cause of mortality worldwide, with women particularly being affected. Current cancer treatments, such as chemotherapy and radiation come with a number of side effects, creating an urgent need for safer and more effective alternatives.

In this light, β-Glucan, a novel polysaccharide derived from baker's yeast Saccharomyces cerevisiae, emerges as a promising candidate due to its cytotoxic effects on various cancer cell lines.

Background: Understanding β-Glucan

β-Glucan is a structurally rigid polysaccharide. Its unique structure, composed of β-(1,3 and 1,6) glycosidic linkages in yeast and mushrooms and β-(1,3 and 1,4) in cereals, gives it various health promoting properties. Notably, yeast derived β-Glucan has been recognized for its capacity to activate macrophage cells, leading to benefits such as lipid lowering, antibacterial, antioxidant and anticancer activities.

By binding to the transmembrane receptor Dectin-1, β-Glucan plays a crucial role in regulating immune responses. Previous studies have highlighted its potential as an immunomodulator and anticancer agent with promising results in advanced breast cancer patients.

Rashmi Trivedi

Study Focus: Exploring Anticancer Potential against Cervical Cancer

This study specifically investigates the anticancer potential of β-Glucan against cervical cancer cells. The research aims to establish β-Glucan as an alternative, efficient and safer therapy in the realm of cancer treatment.

Objectives and Goals

The study's objectives include:

1. Preparing β-Glucan particles from baker's yeast and characterizing them.
2. Conducting high performance thin-layer chromatography (HPTLC) analysis.
3. Determining antioxidant activity.
4. Evaluating anticancer and apoptotic (programmed cell death) activity.

Methodology: A Comprehensive Approach

In characterizing β-Glucan, HPTLC analysis revealed that D-glucose units with β-1,3 links are its major component. Fourier transform infrared (FTIR) analysis further confirmed its β-(1→3)-linked glucan structure. The study evaluated the in vitro cell cytotoxicity using the MTT test and assessed the therapeutic potential through various assays, focusing on concentrations below and above the IC50 (the concentration that inhibits 50% of cell viability). In characterizing β-Glucan, HPTLC analysis revealed that D-glucose units with β-1,3 links are its major component. Fourier transform infrared (FTIR) analysis further confirmed its β-(1→3)-linked glucan structure. The study evaluated the in vitro cell cytotoxicity using the MTT test and assessed the therapeutic potential through various assays, focusing on concentrations below and above the IC50 (the concentration that inhibits 50% of cell viability).

Results: Indications of Cancer Cell Apoptosis

The study observed significant generation of reactive oxygen species (ROS) at concentrations ranging from 50 to 150 µg/ml, indicating the induction of apoptosis in cervical cancer cells.

Morphological changes such as DNA fragmentation in HeLa cells stained with DAPI and a reduction in mitochondrial membrane potential assessed by MitoTracker dye, were also noted. These findings suggest that β-Glucan triggers cellular pathways leading to cancer cell death.

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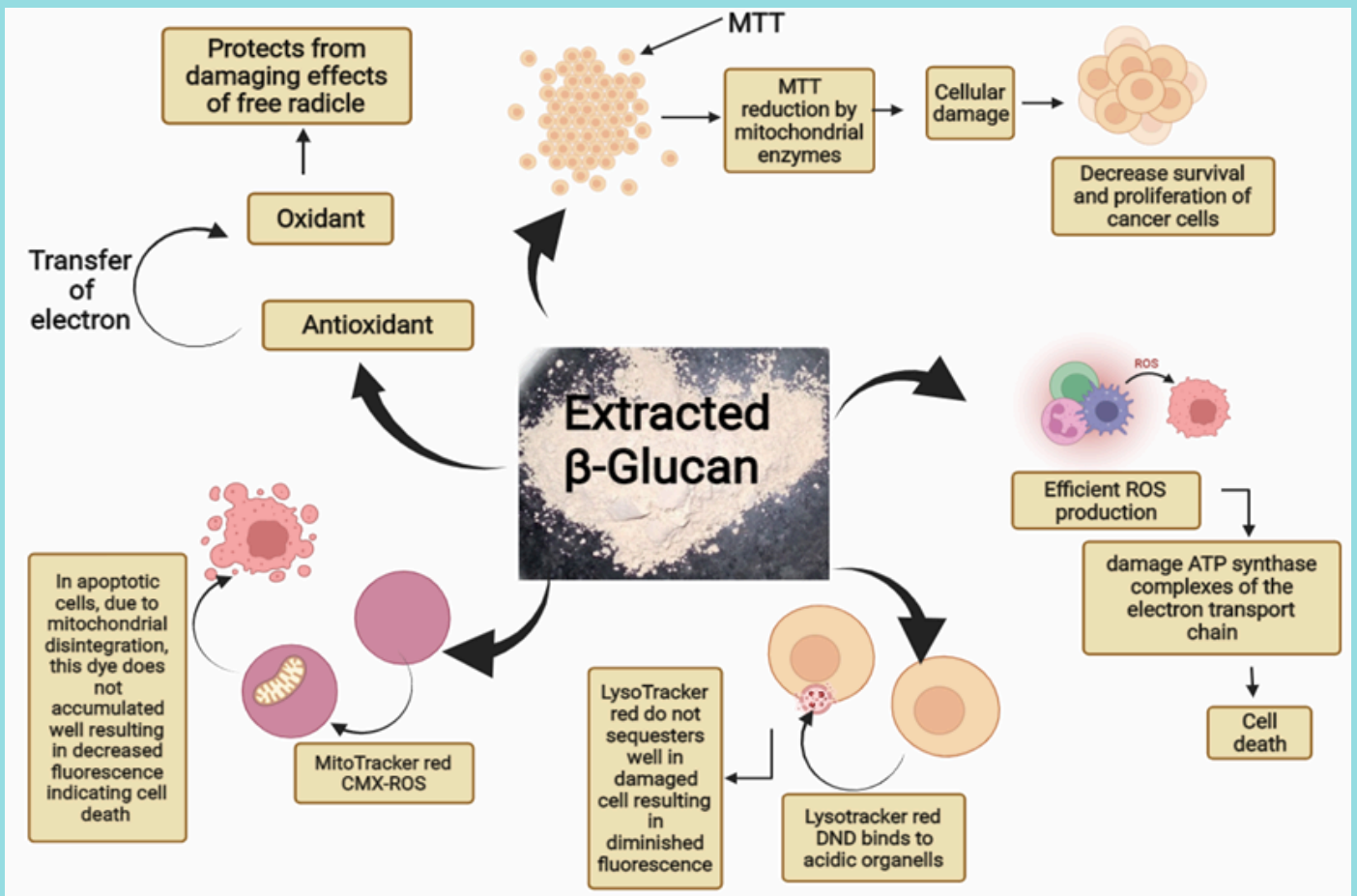
Discussion: In-Depth Analysis and Implications

β-Glucan was extracted using alkaline and acidic methods, followed by spray drying. The anthrone test and HPTLC analysis quantified the sugar content to confirm the polysaccharide's presence. FTIR analysis verified the structure of yeast β-Glucan with 1,3 glycosidic linkage. The radical scavenging activity, evaluated through the DPPH test, demonstrated efficient antioxidant activity. Overall, the study's findings align with the hypothesis that yeast β-Glucan can decrease the growth and proliferation of HeLa cells, a commonly used cervical cancer cell line. (Image 1)



Conclusion: Towards a Future in Cancer Treatment with β-Glucan

The study concludes that β-Glucan possesses the ability to generate ROS in HeLa cells, leading to apoptosis through various inflammatory pathways and oxidative bursts. The analysis of mitochondrial membrane potential and Lyso-Tracker staining further supports that β-Glucan can induce apoptosis in HeLa cervical cancer cells by modulating the immune system. These findings lay the groundwork for further investigation into β-Glucan's complete antitumor potential, potentially revolutionizing cancer treatment approaches.

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