



Investigating the Combined Impact of Natural Products and Chemotherapy on Cancer: Preclinical and Clinical Views

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DESCRIPTION

Cancer is a complex and multifactorial disease characterized by uncontrolled cell growth and proliferation. Conventional chemotherapy, which involves the use of cytotoxic agents to kill rapidly dividing cancer cells, has been a cornerstone of cancer treatment for decades. However, the emergence of drug resistance and adverse effects on healthy tissues have impeded its effectiveness. In contrast, natural products derived from plants, animals, and microorganisms have been recognized for their potential as anticancer agents due to their diverse bioactive compounds and favorable safety profiles.

In recent years, researchers have begun to explore the potential synergistic effects of combining natural products with conventional chemotherapy, aiming to enhance the efficacy and minimize the side effects of cancer treatment. This article delves into preclinical and clinical studies that shed light on the potential of this combination approach in cancer therapy.

Preclinical perspectives

Numerous preclinical studies have demonstrated the synergistic potential of combining natural products with chemotherapy agents. For instance, the combination of curcumin, a bioactive compound found in turmeric, with various chemotherapeutic agents has shown improved therapeutic outcomes in different cancer models. Curcumin has been reported to sensitize cancer cells to chemotherapy-induced apoptosis, inhibit drug efflux pumps, and reduce chemotherapy-induced toxicity in normal tissues.

Likewise, resveratrol, a polyphenol found in grapes and red wine, has demonstrated significant synergy with several chemotherapeutic agents, including cisplatin and paclitaxel. Resveratrol's ability to modulate various molecular targets involved in cancer progression and chemoresistance has contributed to its potential as a valuable adjunct to chemotherapy.

Furthermore, green tea catechins, such as Epigallocatechin Gallate (EGCG), have shown potentiality in enhancing the efficacy of chemotherapy agents. EGCG's ability to sensitize cancer cells to chemotherapy-induced apoptosis and inhibit drug efflux pumps has garnered attention as a potential adjuvant therapy for chemotherapy.

Clinical perspectives

The transition from preclinical to clinical studies is significant for validating the efficacy and safety of combining natural products with chemotherapy in cancer treatment. While the number of clinical trials exploring this combination approach is still limited, early results are potential.

For instance, a clinical trial investigating the combination of curcumin and gemcitabine in pancreatic cancer patients demonstrated improved progression-free survival and overall survival compared to gemcitabine alone. Additionally, the combination therapy resulted in reduced chemotherapy-associated adverse effects, such as nausea and vomiting.

Another study examining the combination of resveratrol and cisplatin in patients with head and neck squamous cell carcinoma reported enhanced therapeutic outcomes and reduced cisplatin-induced nephrotoxicity.

The future prospects

The synergistic effects of combining natural products with conventional chemotherapy offer exciting prospects for future cancer treatments. However, there are a number of issues that must be resolved:

Standardization of natural product formulations:

Natural products often contain multiple bioactive compounds with varying concentrations, leading to inconsistencies in their effects. Standardized formulations are essential to ensure consistent efficacy and safety.

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Received: 03-Jul-2023, Manuscript No. CPECR-23-22458; **Editor Assigned:** 05-Jul-2023, PreQC No. CPECR-23-22458 (PQ); **Reviewed:** 19-Jul-2023, QC No. CPECR-23-22458; **Revised:** 26-Jul-2023, Manuscript No. CPECR-23-22458 (R); **Published:** 03-Aug-2023, DOI: 10.35248/2161-1459.23.13.379

Citation: Shaba E (2023) Investigating the Combined Impact of Natural Products and Chemotherapy on Cancer: Preclinical and Clinical Views. J Clin Exp Pharmacol. 13:379.

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Understanding mechanisms of synergy: In-depth studies are needed to elucidate the molecular mechanisms underlying the synergy between natural products and chemotherapy agents, enabling the design of targeted combination therapies.

Overcoming pharmacokinetic interactions: Natural products may alter the metabolism and pharmacokinetics of chemotherapy drugs, necessitating careful consideration of dosing and drug interactions.

CONCLUSION

The exploration of synergistic effects between natural products and conventional chemotherapy represents an encouraging avenue

for advancing cancer treatment. Preclinical studies have provided compelling evidence of the potential benefits of combination therapy, and early clinical trials have shown encouraging results. However, further research is needed to fully understand the mechanisms of synergy and to optimize the formulation and dosing of natural products to achieve consistent and reproducible therapeutic outcomes. With continued efforts and collaboration between researchers, clinicians, and pharmaceutical industries, the integration of natural products into cancer treatment regimens may lead to improved patient outcomes and a brighter future in the fight against cancer.