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REVIEW

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# Paclitaxel and its semi-synthetic derivatives: comprehensive insights into chemical structure, mechanisms of action, and anticancer properties

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## Abstract

Cancer is a disease that can cause abnormal cell growth and can spread throughout the body. It is among the most significant causes of death worldwide, resulting in approx. 10 million deaths annually. Many synthetic anticancer drugs are available, but they often come with side effects and can interact negatively with other medications. Additionally, many chemotherapy drugs used for cancer treatment can develop resistance and harm normal cells, leading to dose-limiting side effects. As a result, finding effective cancer treatments and developing new drugs remains a significant challenge. However, plants are a potent source of natural products with the potential for cancer treatment. These biologically active compounds may be the basis for enhanced or less toxic derivatives. Herbal medicines/phytomedicines, or plant-based drugs, are becoming more popular in treating complicated diseases like cancer due to their effectiveness and are a particularly attractive option due to their affordability, availability, and lack of serious side effects. They have broad applicability and therapeutic efficacy, which has spurred scientific research into their potential as anticancer agents. This review focuses on Paclitaxel (PTX), a plant-based drug derived from Taxus sp., and its ability to treat specific tumors. PTX and its derivatives are effective against various cancer cell lines. Researchers can use this detailed information to develop effective and affordable treatments for cancer.

**Keywords** Paclitaxel, Anticancer, Molecular mechanisms, Bioactive compounds

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