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Preclinical Development of Drug Delivery Systems for Paclitaxel-Based Cancer Chemotherapy

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## Abstract

Paclitaxel (PTX) is one of the most successful drugs ever used in cancer chemotherapy, acting against a variety of cancer types. Formulating PTX with Cremophor EL and ethanol (Taxol<sup>®</sup>) realized its clinical potential, but the formulation falls short of expectations due to side effects such as peripheral neuropathy, hypotension, and hypersensitivity. Abraxane<sup>®</sup>, the albumin bound PTX, represents a superior replacement of Taxol<sup>®</sup> that mitigates the side effects associated with Cremophor EL. While Abraxane<sup>®</sup> is now considered a gold standard in chemotherapy, its 21% response rate leaves much room for further improvement. The quest for safer and more effective cancer treatments has led to the development of a plethora of innovative PTX formulations, many of which are currently undergoing clinical trials. In this context, we review recent development of PTX drug delivery systems and analyze the design principles underpinning each delivery strategy. We chose several representative examples to highlight the opportunities and challenges of polymeric systems, lipid-based formulations, as well as prodrug strategies.

**Keywords:** paclitaxel, drug delivery, nanomedicine, cancer, chemotherapy.

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