

# Nanospheres of Biodegradable Polymers: A System for Clinical Administration of an Anticancer Drug Paclitaxel (Taxol®)

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## Abstract

**Introduction:** Paclitaxel is a natural antineoplastic drug. It has been approved by the Food and Drug Administration (FDA) for the treatment of various cancers, especially ovarian and breast cancers with the best effect over other anticancer agents. Due to its high hydrophobicity however, an excipient such as Cremophor EL has to be used, which causes additional serious side effects. This study was intended to investigate the feasibility to apply nanospheres of biodegradable polymers as an alternative system to achieve best results with least side effects. **Materials and Methods:** FDA-approved biodegradable polymers such as poly(D, L-lactic-co-glycolic acid) (PLGA) and poly(D, L-lactic acid) (PLA) were used to fabricate paclitaxel-loaded nanospheres by the solvent extraction/evaporation technique. The nanospheres fabricated in various conditions were characterised by laser light scattering for size and size distribution, scanning electron microscopy (SEM) and atomic force microscopy (AFM) for surface morphology, X-ray photoelectron spectroscopy (XPS) for the chemical structure of the surface. The drug encapsulation efficiency (EE) and the in vitro release kinetics were measured by HPLC. **Results:** The products ranged from 300 nm to 700 nm with low polydispersity. The in vitro drug release can last more than 6 months at an approximately constant rate after an initial burst. The release kinetics can be fully controlled by the material used and the fabrication conditions. **Conclusions:** Nanospheres of biodegradable polymers can be an ideal carrier for paclitaxel to eliminate the side effects caused by the excipient currently used in clinical administration. The technique developed can also be applied to other anticancer drugs.

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**Key words:** Atomic force microscopy, Chemotherapy, Controlled release, Encapsulation efficiency, Surface property

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