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## Using Gold Nanoparticles for Combination Therapy of Gemcitabine

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### Abstract

The most of chemo drugs have short half-life. The inadequate sustained release can lead to severe side effects, including myelosuppression and nephrotoxicity. In our studies were used the properties of gold nanoparticles (AuNPs). For example, one of them presents a novel nano-drug delivery system utilizing AuNPs optimized with ascorbyl palmitate (AsP) to enhance gemcitabine hydrochloride (GEM) stability and therapeutic efficacy. AuNPs were modified using a single-phase emulsification technique to create a nanoemulsion coated with a hydrophobic AsP layer, resulting in improved tumor targeting through the enhanced permeability and retention (EPR) effect. Besides that, in another study AuNPs was synthesized by PEG. The modified AuNPs was immobilized by GEM and Paclitaxel (PAX). The formulations demonstrated a sustained release profile, and enhanced cytotoxicity in the 4T1 and MIA-PACA-2/ PACA-1 cell lines, respectively. Significantly outperforming free GEM/PAX and modified Au-GEM/Au-PEG-GEM/PAX formulations. Notably, for AuNPs-GEM/AsP and Au-PEG-GEM/PAX, those exhibited several months of accelerated stability, attributed to amide bond formation in the functionalized AuNP matrix. The study highlights the synergistic effects of AsP or PAX in enhancing the therapeutic efficacy of Au-GEM-based formulations, supporting its role as a key component in combination therapy. These researches lay the foundations for future developments AuNPs devices that combine chemo drugs for therapeutic and diagnostic applications in nanomedicine.

**Key words:** Gold Nanoparticles, Combination Therapy, Gemcitabine, Paclitaxel

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**References**

- [1] Mubin Tarannum, Juan L. Vivero-Escoto. Nanoparticle-based therapeutic strategies targeting major clinical challenges in pancreatic cancer treatment. *Advanced Drug Delivery Reviews*. Volume 187, 2022, 114357.
- [2] Mohamed El-Far, A. E., Fardous F. El-Senduny, Amira O. Abd El-Azim, Sarah Yahia, Ibrahim M. El-Sherbiny. Synergistic Anticancer Effect of Melatonin and Ascorbyl Palmitate Nanoformulation: A Promising Combination for Cancer Therapy. *Biointerface Research in Applied Chemistry* 2023, 13 (6), 17.
- [3] Heinemann, V. Role of Gemcitabine in the Treatment of Advanced and Metastatic Breast Cancer. *Oncology* 2003, 64, 16.