Zahra Eskandari et al., J Nanomater Mol Nanotechnol 2018, Volume 7
DOI: 10.4172/2324-8777-C2-023

24th World Nano Conference

May 07-08, 2018 | Rome, Italy

Active targeting of breast cancer using Pirarubicin-loaded biodegradable nanocarriers

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Breast cancer is one of the leading reasons for the morbidity and mortality of cancer-related death globally. Due to nonspecific targeting by anticancer agents, many current treatments, including chemotherapy, lead to side effects and poor solubility of some agents cannot bring out the desired outcome in most cases. The main challenge of cancer therapeutics is to differentiate the cancerous cells and the normal body cells. Nanoparticle-based drug delivery systems have considerable potential for treatment of cancers. The important technological advantages of nanoparticles used as drug carriers are high stability, high carrier capacity, feasibility of incorporation of both hydrophilic and hydrophobic substances, and feasibility of variable routes of administration and therefore minimizing the side effects of anticancer drugs. Enhanced permeability and retention seen in the cancerous area leads properly-sized nanoparticles to enter the area and release the contained drugs. Pirarubicin, a newer generation of anthracycline anticancer drugs, seems of great interest in cancer treatment. Chemical structure of Pirarubicin allows its quick absorption by tumor cells, easy distribution to the cell nucleus and more efficient incorporation into DNA. In spite of undisputed key role of anthracyclines in the clinical cancer therapy, their successive doses will induce irreversible cardiomyopathy that can be lethal even after the cessation of treatment and can lead to lots of other reported side effects. Beside this, its hydrophobic structure will require more amount to be used to reach the minimum effective concentration. Hence delivering Pirarubicin using nanocarriers will be an effective way to increase efficiency and reducing side effects. Since receptors for vasoactive intestinal peptide (VIP-R) are overexpressed in human breast cancer, in this study VIP was attached to the surface of biodegradable nanoparticles containing Pirarubicin for active targeting drug delivery to breast cancer. The efficiency of pure Pirarubicin and pirarubicin-loaded nanoparticles in MCF-7 human breast cancer cell lines was explored. The study confirmed the cytotoxic effect of formulations on the MCF-7; therefore, formulations could be utilized as a source for developing novel drugs against breast cancer.

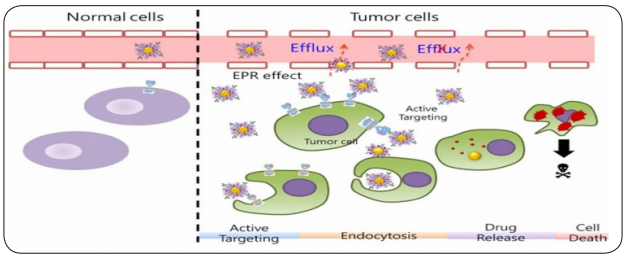

Figure 1: Enhanced permeability and retention (EPR).

Recent Publications:

1. Bharali D J , Mousa S A (2010). Emerging nanomedicines for early cancer detection and improved treatment: current perspective and future promise. Pharmacology and Therapeutics. 128(2):324-335.
2. Terry W, Moodya Bernardo Nuche Berenguerb and Robert T Jensenb (2016) VIP/PACAP, and their receptors and cancer. Curr. Opin. Endocrinol. Diabetes Obes. 23(1):38-47.
3. Jabir N R et al. (2012) Nanotechnology-based approaches in anticancer research. International Journal of Nanomedicine. 7:4391-408.
4. Bahadori F et al. (2014) A newlipidbased nano formulation of vinorelbine. AAPS PharmSciTech. 15(5):1138-1148.
5. Zou H Y et al. (2009) Studying the interaction of pirarubicin with DNA and determining pirarubicin in human urine samples: combining excitation-emission fluorescence matrices with second-order calibration methods. J Fluoresc. 19(6):955-66.

Biography

Zahra Eskandari is a PhD student in Biochemistry in Yildiz Technical University, Istanbul, Turkey. She is also a Master's student in Bioengineering in Marmara University, Istanbul, Turkey. Her main areas of interest include drug delivery systems, actively targeted nano delivery systems for treatment of cancer, biology of cancer, isolation and characterization of natural products and their charachterization and biopolymers.

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