Nanoparticle Drug Delivery Systems: An Approach to Reverse Multidrug Resistance in Cancer
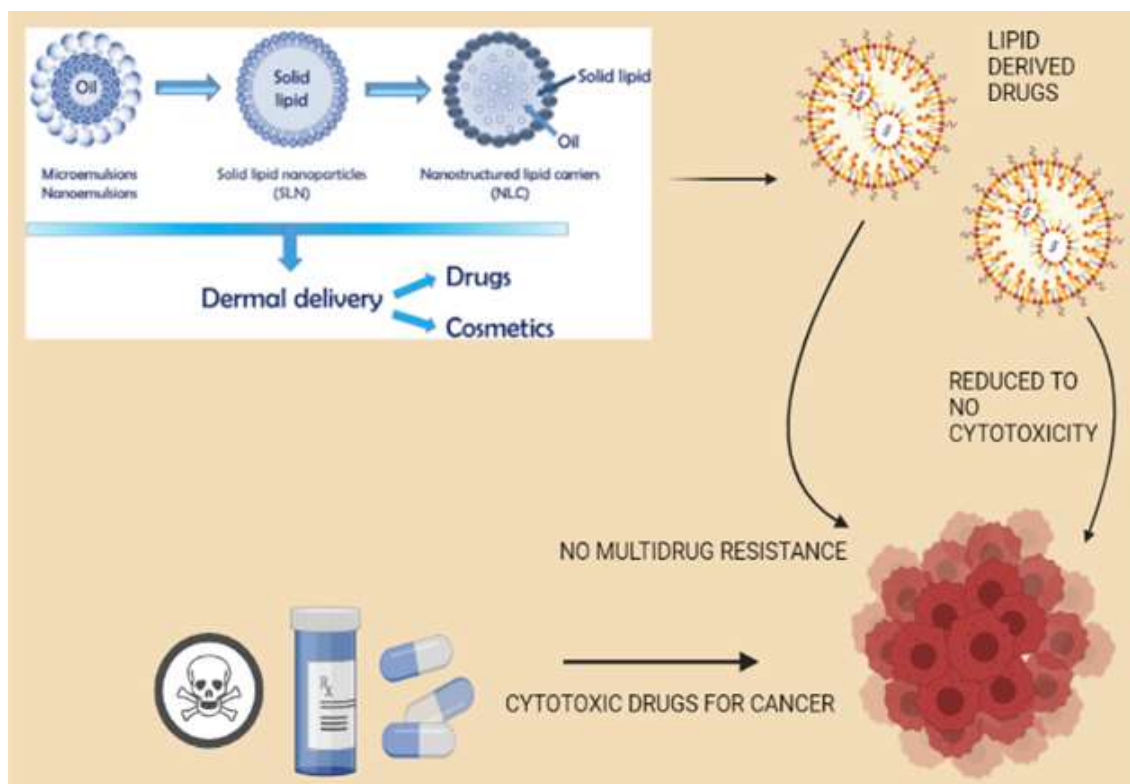
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ABSTRACT

Recently, there have been studies that show the high impact of the novel nano - drug delivery technology on several applications. Notably, the promising significant impacts of nanostructured lipid carriers (NLC) development are severe chronic and acute pathologies such as tuberculosis, cancer, Parkinson's and other neurodegenerative illnesses, epilepsy, neglected diseases, etc. One of the main problems of cancer   chemotherapy is the high cytotoxicity of the drugs available in the market. Besides, most of the current anticancer drugs administered lack specificity for cancer cells and metastatic cancers, reaching many other non-targeted tissues and thus causing severe damage to other cells and tissues. Also, a very high drug concentration is required to obtain some treatment efficacy, but it results in significant toxic effects on the body. These characteristics of chemotherapeutic drugs could also create a multidrug resistance (MDR) to the treatment.

NLCs are capable of bringing a solution by reducing the drug concentration to be administered and thus consecutively decreases cell toxicity and increases the effectiveness of the treatments by successfully modifying the cell surface with molecules specific to the target markers of cancer cells. Another potential strategy can be the use of prodrugs that are encapsulated in the nanoparticles that are activated on-site by the biological mechanism followed by the tumoral cells that are otherwise free to work and can activate anywhere in the body. With good biocompatibility and high stability accompanied with targeting properties of drug release- this delivery system can alter the mechanism by which drugs function to reverse the multidrug resistance working through an active or passive targeting and thereby reducing the drug elimination. Given the potential role of nano-drug delivery systems used in multidrug resistance, the current study recaps the existing knowledge on the properties of lipid nanoparticles, liposomes, polymeric micelles and focuses on their pivotal role in combating the MDR. Through our current research, we aim to improve the efficacy of chemotherapy and also reduce the toxicity in order to prolong the lives of cancer patients.

Keywords- Nanoparticles, drug delivery systems, multidrug resistance, cancer

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