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Short Communication

Targeted Liposomes: Recent Applications in Human Welfare

Ashok Vanagamudi, Padmini Jeyarajan*

Department of Biochemistry, Shri Sathya Sai Medical College and Research Institute, Ammapettai, Tamil Nadu, India

DESCRIPTION

Liposomes are microscopic spherical vesicles enclosed by a phospholipid bilayer. Liposomes can be filled with drugs and can be used to deliver drugs for cancer and other active molecules to the site of action. At present several liposomal formulations are in clinical use. Further, by synthetic modification of the terminal Polyethylene Glycol (PEG) molecule, liposomes can be actively targeted with monoclonal antibodies or ligands [1]. Conventional liposomes are made up of phospholipid bilayers, and, when administered intravenously, are taken up by the Reticuloendothelial System (RES), thus have short circulation times. Functionalization of liposomes with a suitable ligand, i.e., peptides, antibodies or their fragments, for targeted delivery of anticancer agents at the tumor site, using overexpressed receptors have resulted in the formation of ligand targeted liposomes or targeted liposomes.

Applications of targeted liposomes

The conventional approach for cancer therapy results in low accumulation of anticancer agents at the required tumor site with associated off-target side effects. Consequently, several strategies have been developed and utilized for targeting and delivery of anticancer agents at requisite location to attain the optimal response in cancer therapy using liposomes. Passive targeting (with enhanced-permeability and retention effect) and active targeting are the main strategies for the delivery of anticancer agents at tumor site. Several strategies have been employed for delivery of anticancer agents at tumor site, e.g., active and passive targeting. Active targeting with a combination of other approaches, e.g., stimuli sensitivity, is the current approach in tumor therapy. In this connection, liposomes are grafted with a variety of targeting ligands, e.g., peptides, aptamers, antibody fragments, etc., using different surface engineering techniques.

The current strategy is to target the anticancer agents, i.e., drug, at the diseased tissue site, i.e., tumor tissues, with minimum deposition at the non-targeted tissues or with lesser off target effects. This approach resulted in direct targeting of payload at the requisite site, and is termed active targeting or ligand based targeting. This involves the attachment of a targeting ligand to the surface of liposomes which when administered to the cancer bearing mice tracks and targets the receptors on the diseased cells. Such liposomes are called as ligand targeted liposomes or targeted liposomes [2].

Targeted liposomes production involves the attachment of targeting moieties which are capable of recognizing the target cells, binding to them, and inducing the internalization of liposomes or encapsulated drugs. Targeting moieties include monoclonal antibodies or fragments, peptides, growth factors, glycoproteins, carbohydrates, or receptor ligands [3].

The monoclonal antibody anti-HER2 trastuzumab was the first human monoclonal antibody for metastatic breast cancer [4]. Folic acid has been used for liposome-specific targeting of doxorubicin, daunorubicin, cisplatin, and other drugs to cancer cells [5]. Transferrin is a popular ligand for specific delivery of anticancer drugs, proteins and genes to malignant cells [6]. Haloperidol-associated targeted liposomes can efficiently target genes to sigma receptor overexpressing breast cancer cells [7]. Peptides involved in cell-to-cell interactions have been used as targeting agents for liposomes targeting with L-peptide increased liposomal drug toxicity on nasopharyngeal cells [8]. Liposomal vaccines can be developed to target specific immune cell types for the induction of certain immune responses [9].

CONCLUSION

Targeted liposomes can play a major role in drug delivery, more efficiently than conventional liposomes on a target based approach. PEG coated liposomes with increased stability can easily be modified using a wide array of targeting moieties (monoclonal antibodies, ligands) to deliver the drug specifically to the target tissues with increasing accuracy.

CONFLICT OF INTEREST

Nil

Correspondence to: Dr. Padmini Jeyarajan, Department of Biochemistry, Shri Sathya Sai Medical College and Research Institute, Ammapettai, Tamil Nadu, India-603108, Tel: +918838860732; E-mail: padhu496@gmail.com

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