

Exosomes, Microvesicles as Diagnosis, Therapeutic and Drug Delivery Tools

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Abstract

Exosomes are extracellular vesicles with nano size range. The use of exosomes as drug delivery vehicle has useful advantages compared to other vesicular systems. Exosomes are nonimmunogenic, nontoxic, and stable with good composition and potency for crossing blood brain barrier. They can be used as theranostic agents and vaccine therapy. The exosomes are a new choice for nonimmunogenic targeted drug delivery vehicle.

Introduction: Exosomes are nano size vesicles secreted by different cell types. The main role of exosomes in the body is a cell to cell communication. They are not immunogenic due to similar structure as body cells. They can cross blood brain barrier, stable in the blood circulation, biocompatible, with low toxicity, suitable size, and structure. These endogenous vesicles can be used for drug delivery, immunevaccines and as diagnostic agents.

Methods: The following databases were reviewed for bibliography of using exosomes as delivery agents: Web of science, Scopus, Medline, and Embase.

Results: Exosomes can deliver different kinds of cargos (RNA, proteins and small molecules) to the target cells. Exosome as a biomarker of diseases (cancer, cardiovascular disease, MS, etc) personalized therapy with the exosomes that generated from induced pluripotent stem cell (iPSC) derived that used for patient specific and disease specific cell therapy. They have specific role in tissue repair and regeneration, vaccines for immunotherapy (phase II of clinical trial). The strategies to introduce drugs into exosomes are active and passive loading. Artificial exosome mimetics can be isolated from exosome secreting cell lines but these exosomes in comparison with autologous are immunogenic. Isolation techniques of exosomes are ultracentrifugation, electron microscopy, and SDS page. Exosomes were mainly taken up by macrophages in the liver after IV administration. Exosomes characterization methods are biophysical, molecular and microfluidics.

Conclusion: Exosomes are good carriers for delivery of drugs and genes to the target without immunogenic reaction. They can be used as immunovaccines for the cancer treatment by activating immune system against tumor cells. Exosomes can substitution the liposomes because of their size, structure, non-immunogenicity and their natural composition.

Key words: Exosomes, Extracellular vesicles, Drug delivery, Nano carrier, Immunovaccine