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Nanoparticle therapeutics: a new treatment of cancer

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INTRODUCTION

To get speedy recovery from any deadly diseases, the most important thing is getting proper medication[1-9]. In the passing years, it has been seen that cells and specific genes in the human body are acquiring drug resistance capability against certain drugs which needs to work correctly for getting rid of any particular diseases. Therefore, the introduction of nanoparticle and exosomes are gaining importance in drug manufacturing units. It is not only helping the drug get administered into the exact position where it needs to get delivered but also hastening speedy recovery of the patient from a lethal disease[10-19].

Numerous methods are used to get rid of the problem like drug resistance ability, impassability of drugs through intercellular pathways and gene silencing activities.

It has been seen that few specific cancers like glioblastoma are more robust to get diagnosed in the initial stages. Hence, during the final stages, it becomes impossible for chemotherapeutic drugs to get administered into the exact location of the disease.

Nanoparticles are used in this regard for early detection and treatment of such specific brain tumor cases[20-31]. Apart from that, exosomes, as extracellular organelles can be used to get proteomic and genetic information from long distance intercellular communication. Along with it, exosomes are used for proper drug delivery on the exact location where the disease is mainly predominant.

Similarly, psychosis is another fatal disease that is impacting thousands of people worldwide. Nanoparticles are used for the treatment of this disease for delivering the drug. Nanoparticles of 1-500 nanometers are used primarily to administer antipsychotic drugs into the human body so that the administered drugs can get easily absorbed through the blood-brain barrier[32-44].

To control the impact of multidrug resistance among the human sometimes excessive amount of drugs get administered, but it only causes intolerance of toxicity and death of the patient. Along with it, histone modification and DNA methylation have been introduced to minimize the issues in this regards. Synthesis of oligonucleotides after some chemical modification and synthesis of some nano-sized camptothecin for combined drug delivery are also few steps that are getting followed. Doxorubicin (DOX) is the best medication used for curing the malignant tumor. Apart from that, lung and cervical carcinomas T7 peptide conjugated nanoparticles are mainly used.

Table 1: Nanoparticles with Dual Drug Delivery to Control MDR

Materials	Agent 1	Agent 2	Cancer cell lines	Ref
Poly(ε-caprolactone) and poly(ethyl ethylene phosphate)	Doxorubicin	NA	MCF-7/ADR	(38)
Poly(lactic-co-glycolic acid) and polyethylene glycol	Vincristine	NA	MCF-7/ADR	(42)
Pluronic-P105	Doxorubicin	Paclitaxel	MCF-7/ADR	(46)
Poly(ethylene oxide)-poly(propylene oxide)-poly(ε-caprolactone)	Docetaxel	Chloroquine	MCF-7 and MCF-7/ADR	(47)
VE and tocopherol poly(ethylene glycol)succinate	Paclitaxel	5-Fluorouracil	KB-8-5 and KB-3-1	(48)
Poly (lactic-co-glycolic acid)	Docetaxel	TPGS	HeLa	(50)
EPC, DOTAP, cholesterol and PEG2KPE	Paclitaxel	Tariquidar	SKOV-3 and SKOV-3TR	(51)
CEA and AHM	Doxorubicin	Verapamil	NCI/ADR-RES	(53)
Chitosan	Doxorubicin	Pyrrolidinedithiocarbamate	HepG-2	(54)
TPGS2000 and PEG2000-DSPE	Doxorubicin	Curcumin	MCF7/ADR	(55)
Poly(D,L-lactide-co-glycolide)	Doxorubicin	Curcumin	K562	(56)
1-Palmitoyl-2-azelaoyl-sn-glycero-3-phosphocholine	Doxorubicin	Ceramide	P388/ADR	(57)
Precirol ATO 5,Squalene, SPC, Tween-80 and DOTAP	Doxorubicin/Paclitaxel	siRNA targeting MRP1 and BCL2	A549	(62)
PAMAM and PEG-2K-DOPE	Doxorubicin	siRNA targeting GFP	A549 cells and C166-GFP	(63)

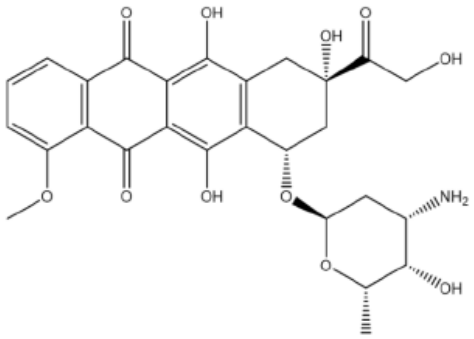

Figure 2: Chemical Structure of DOX

Different strategies and process have been invented for careful drug delivery into the affected areas. To control the multi-drug resistance (MDR), the process to introduce multiple chemotherapeutic drugs is used nowadays. Apart from this, nanoparticles used for antipsychotic disease treatment is comparatively low while it is mainly used for cancer treatment[45-51]. This is only for the lack of knowledge about psychosis that restricts the drugs from being designed. Similarly, safe designing of the EMs cell for gene therapy is used for the proper treatment of cancer cells of the human body. On the other hand, DNA methylation represses the growth and spread of cancer cell for the long term. Non-small-cell lung cancer (NSCLC) is a lethal form of lung cancer that accounts for 80% of total lung cancer cases around the world. NSCLC is less responsive for chemotherapy, radiotherapy and any treatment.

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