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Nano Capsule –Novel Drug Delivery Approached In Cancer Therapy.

Dharm Jeet Yadav, Piyush Yadav*, and Manoj Kumar Yadav.

Prasad Institute Of Technology, Department Of Pharmacy, Jaunpur – 222001, Uttar Pradesh, India.

ABSTRACT

Novel Drug Delivery Systems (NDDS) have numerous points of interest, which comprise better therapy by increasing the efficacy and duration of drug activity, improved patient compliance through reduced dosing frequency. It provides appropriate routes of administration and enhanced targeting for a particular site to anticipate hurtful reactions. The Different types of advanced drug delivery approach like polymeric Nano capsules, nanoparticles, liposomes, nanoemulsion, microsphere, microcapsules, hydrogels has been expressed utilizing bioactive and plant extracts. NDDS have significant advantages over conventional therapy for cancer treatment, which include improved solubility and bioavailability, low toxicity, maximum therapeutic effect, sustained and controlled drug delivery, improvement of stability and batter security from physical and biochemical degradation. This article covers the basic information and different types of Novel Drug Delivery Systems Currently, a majority of cancer treatment strategies are based on the removal of tumor mass mainly by surgery. Chemical and physical treatments such as chemo- and radiotherapies have also made a major contribution in inhibiting rapid growth of malignant cells. Furthermore, these approaches are often combined to enhance therapeutic indices. It is widely known that surgery, chemo- and radiotherapy also inhibit normal cells growth. In addition, these treatment modalities are associated with severe side effects and high toxicity which in turn lead to low quality of life. This review encompasses novel strategies for more effective chemotherapeutic delivery aiming to generate better prognosis. Currently, cancer treatment is a highly dynamic field and significant advances are being made in the development of novel cancer treatment strategies. In contrast to conventional cancer therapeutics, novel approaches such as ligand or receptor based targeting, triggered release, intracellular drug targeting, gene delivery, cancer stem cell therapy, magnetic drug targeting and ultrasound-mediated drug delivery, have added new modalities for cancer treatment. These approaches have led to selective detection of malignant cells leading to their eradication with minimal side effects. Lowering, multi-drug resistance and involving influx transportation in targeted drug delivery to cancer cells can also contribute significantly in the therapeutic interventions in cancer.

Keywords: Drug release, Dosage forms, Hydrogel, Cancer therapy, Novel drug delivery system, Nanoparticles,

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Corresponding author

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INTRODUCTION

Nanocapsules, existing in miniscule size, range from 10 nm to 1000 nm. They consist of a liquid/solid core in which the drug is placed into a cavity, which is surrounded by a distinctive polymer membrane made up of natural or synthetic polymers. They have attracted great interest, because of the protective coating, which are usually pyrophoric and easily oxidized and delay the release of active ingredient [1].

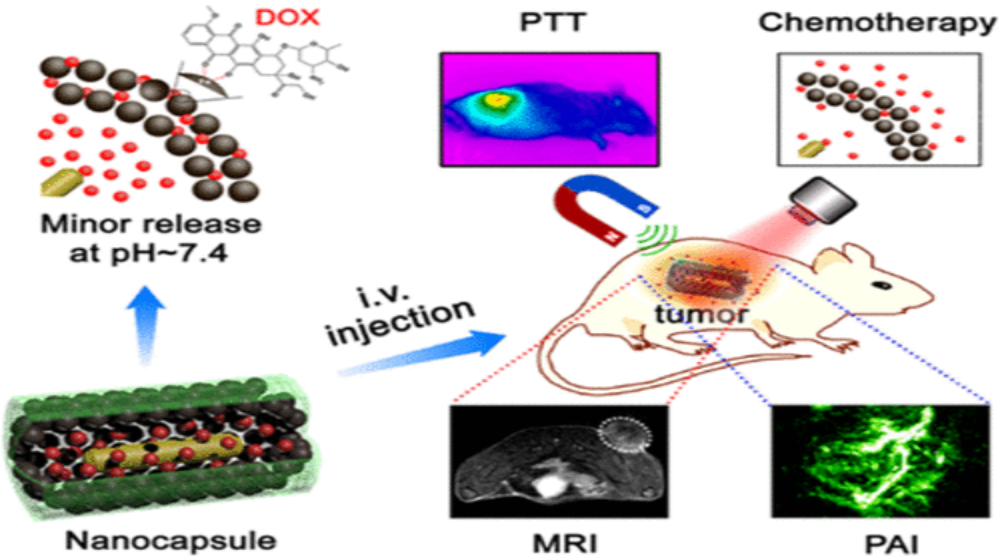

Fig- Approaches for drug vehicles, targeting, and release

It is well-known that the activity of the anticancer drugs is greatly attenuated by the time drug reaches the target, which can render the treatment to be ineffective and increase off-target effects. The effectiveness of anticancer drug treatment can be achieved only when the administered drug is of proper dosage and display maximal activity in the cancer cells. Thus, the nanomaterials used for targeting tumor cells should have the capability of increasing local concentration of the drugs in and around tumor cells, thereby reducing the potential toxicity toward healthy cells.The efficient delivery of nanomaterials to the target tissues can be classified as passive and active targeting, as discussed below.

Different Drug Delivery System

Lipoprotein

In any ideal drug delivery system, an acceptable amount of active therapeutic drug must be assimilated and transported to the site of activity at the favourable time and rate.Lipoprotein as a medication system for malignancy therapy.Lipoprotein can be utilized as a Targeted drug delivery system in malignancy therapy which helps to improve therapeutic index of anticancer agents, either by expanding the concentration of medication in tumor cells or by diminishing the interaction in normal host tissues. Low density lipoprotein is potential transporter for chemotherapeutic mediators. They are utilized for targeted delivery of anticancer because several types of malignant cells display higher level of receptor mediated uptake of low density lipoprotein.For clinical malignancy therapy liposomes and phospholipid vesicles, have beenknown as a potential drug delivery system This system protecting healthy cells from toxic effect and keep their concentration in susceptible tissues for example in patient kidneys and their liver [1-3].

Nanoparticle

Nanoparticles are in the solid state and are either amorphous or crystalline in nature with size range (from 10 to 200 nm. It secures drug against chemical and enzymatic dilapidation.Biodegradable polymeric nanoparticles have few applications in the controlled release of therapeutic medications in targeting specific tissue or organs as carriers in gene therapy [2].

Nanoemulsion

Nanoemulsions can be characterized as oil-in-water (o/w) emulsions with mean droplet size from 50 to 200 nm and the particles can exist as both water-in-oil and oil-in water forms, where the core of the particle is whichever water or oil. Nano-emulsions like microemulsion may have high optical transparency and kinetic constancy [2, 3].

Microcapsules

Numerous anticancer agents (such as paclitaxel, PCT; camptothecin, CPT; and certain porphyrins like meso tetraphenylporphine, TPP, utilized as a part of photodynamic treatment, PDT) with stumpy aqueous solubility affect their application and makes direct parenteral administration more complicated. Novel drug delivery strategies based on the drug carrier systems approaches have been advised to overwhelmed their reduced solubility, little stability, and dangerous symptoms. PEG diacyllipids conjugates have attracted much consideration towards their easily controlled properties and great pharmacological features [3, 4].

Microemulsion

Microemulsions are defined as liquid scatterings of water and oil that are prepared thermodynamically stable formulation which is homogenous, transparent or translucent in nature by the addition of relatively huge oncentration of a surfactant and a cosurfactant. Microemulsion droplets diameter having range of 10-100 nm and have been extensively considered for targeted drug delivery system to the brain. It is a cost effective strategy and enhances the bioavailability of the poorly dissolvable medications [4-6].

Microspheres

Microsphere technology is the newest development in cancer chemotherapy. Microsphere is solid porous particles with diameters 1 - 100 µm. It can focus on their medication load by physical trapping in blood veins known as chemoembolisation and sustain therapeutic agent action through controlled release. Biodegradable microspheres are used for direct delivery of drugs to organ(s) by lodging therapeutic drug in the end organ vessels. Its effect depends on the size and mode of administration of the microsphere either intravenous or intra-arterial [7-11].

Dendrimers

Dendrimers are highly branched-three-dimensional, monodisperse molecules with highly controlled structures. Its monodispersity, encapsulation ability, water solubility and huge number of peripheral functional groups, make them perfect candidates for assessment as medication delivery system. Recently, dendrimers used as drug delivery system for anticancer drugs in variety of cancer therapies.

Mainly there are three methods used for drug delivery through dendrimers (a) attachment of drug to periphery of the dendrimer through covalent bond to form dendrimer prodrugs, (b) the drug is synchronized to the outer functional groups through ionic interactions, or (c) host-guest supramolecular assembly [12-15].

Hydrogels

Hydrogels are three-dimensional networks of water-swollen polymers. It usually comprises crosslinked hydrophilic polymers which cross-linked either through covalent bonds or composed by physical intramolecular and intermolecular attractions that swell readily without dissolving in aqueous solution .Because of hydrogel unique ability to swell under biological conditions makes them an ideal class of materials for biomedical applications, for example drug delivery and tissue engineering .Hydrogels are highly hydrophilic in nature due to the presence of some hydrophilic moieties such as carboxyl, amide, amino, and hydroxyl groups [16-19].

CONCLUSIONS

The multidisciplinary field of nanotechnology's applica-tion for discovering new molecules and manipulating those available naturally could be excited in its potential to improve health care. Nanotechnology is definitely amedical boon for diagnosis, treatment and prevention of various diseases including cancer. It supports and ex-pands the scientific advances in genomic and proteomics and builds on our understanding of the molecular under-pinnings of cancer and its treatment. We then review the current state of the art of nanoparticle-based therapeutics that have reached the clinic for its efficient advantage as drug carrier which are high stability, high carrier ca-pacity, feasibility of incorporation of both hydrophilic and hydrophobic substances of variable routes of ad-ministration including oral application and inhalation. Multi functional NPs also have the capability to concur-rently carry therapeutic agents, squares imaging contrastagent,diamonds and targeting moieties which can be used as anti-cancer agents. Interestingly pharmaceutical sciences are using NPs to reduce toxicity and side effects of drugs. The kind of hazards that are introduced by us-ing NPs for drug delivery are beyond that posed by con-ventional hazards imposed by chemicals in classical de-livery matrices.

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