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Contemporary Worldwide Patent Filing Trends in Liposomal Drug Delivery System: Prospects and Perspectives

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ABSTRACT

In the international scenario, an increased attention has been gained by the drug delivery system utilizing vesicular structures like liposomes. The reason behind such escalated interest among the researchers towards this liposomal drug delivery system in particular, has given concrete evidence that the drugs are very safe to be administered to the mankind and by which the drug itself are very safe in its dosage form, until it performs its intended purpose. However, the other perquisite of being targeting the drug with such vesicular systems as magneto liposomes to neoplasmic cells are highly favourable for the current researchers and so only, a momentum of good worth has been observed. This point in time, in this review work we have indulged in assessing recent patent filling trend and current research work in progress viz-a-viz advanced liposomal drug delivery systems (LDDS), has been discussed in detail. In this review, we have included other recent advancements of LDDS in current times.

Keywords: Liposomal drug delivery systems; Patent filling trend; Magneto-liposomes

INTRODUCTION

Malignancy remains still a significant issue around the world, prompting numerous fatalities. There are numerous accessible anticancer drugs that actually neutralize tumors, yet their dose in anticancer treatments is restricted because of various side effects. Currently, carriers known as drug delivery systems (DDS) are utilized to restrict the organization of ordinary drugs and work on the wellbeing of pharmacological treatment of patients. As per the DDS definition, these are arrangements that empower the controlled presentation and distribution of the drug in the organism.

However, a few magneto-liposome structures have been accounted to ensure efficient transport and delivery of therapeutics, while working on magnetic properties. Furthermore, novel techniques have been introduced to enhance the release of such drugs, as well as to accomplish successive release of various therapeutic specialists. In this regard the proof of past research evidence shows that, liposomal drug delivery system has got a trait of delivering drug in safest way to the malignancy is concern.

DISCUSSION

Targeted magneto-liposomes on pro-drug (EP1255533A2)[5] (2.1)

The biological tissue responsive to an applied magnetic field encompass a magneto liposomes, each magneto liposome of the multiplicity having a lipid-containing wall defining a vesicle, and a many numbers of subdomain super paramagnetic particles, and an inactive prodrug proficient enough to activate into a drug effective for treatment of the biological tissue, the prodrug contained in the manifold of magneto liposomes for delivery to the biological tissue.

The drug by applying an electromagnetic field to the concentrated plurality of magneto liposomes so as to therein generate heat sufficient for activation without appreciable rupture of individual magneto liposomes of the plurality of magneto liposomes, and releasing the triggered active drug into the biological tissue by adequately increasing permeability of the lipid-containing walls of separate magneto liposomes of the plurality of magneto liposomes to thereby release activated drug. On the other hand, currently are no radiation sensitizers approved by the united states Food and Drug Administration (FDA), some chemotherapy agents are regularly used off-label to upsurge the effectiveness of radiation treatment. However, the use of chemotherapy agents as radiation sensitizers has been inadequate by lack of tumor localization and by the systemic harmfulness of these agents.

Magnetic Nano particulate system (PT115474B) [6] (2.2)

Magneto liposomes are Nano transporters based on liposomes that integrate magnetic nanoparticles consist of an internal magnetic nucleus, whether a number of nanoparticles or a magnetic fluid, covered by a lipid layer. Magneto liposomes may be loaded with a molecule, particularly therapeutic drugs that will be released conferring to the explicit target site of the disease, predominantly in cancer. In this context, the lipid composition of the bilayer can be handled according to the type of cancer family to be treated and to the specific requirements for the micro-environment.

Liposome for targeted degradation (WO2009044406A2)[7] (2.3)

The invention provides a liposome for degrading target protein by chemical targeting and a preparation method thereof, and the liposome comprises the following raw materials in percentage by mole: 30 to 99.8 percent of phospholipid, 0 to 40 percent of cholesterol, 0 to 10 percent of distearoyl phosphatidyl ethanolamine-polyethylene glycol, 0.1 to 20 percent of functional phospholipid or functional polymer modified by targeted protein drugs, and 0.1 to 20 percent of functional phospholipid or functional polymer modified by E3 ligase ligand. Compared with PROTAC, the liposome for chemically targeted degradation of the target protein has good water solubility and high cell internalization competence, is suitable to optimize the ratio of the target protein drug to the E3 ligase ligand, and improves the effect of degrading the target protein in vivo.

The protein degradation targeting chimeras (PROTAC) is a bifunctional targeting hybrid compound, target protein ligands and E3 ligase ligands are chemically coupled through connecting groups to induce ubiquitination of the target proteins, and the target proteins are recognized by proteasomes to be degraded, so that an anti-tumor beneficial consequence is generated.

Toad tryptamine liposome for pain, inflammation and depression (CN114432247A) [8] (2.4)

Current invention includes a toad tryptamine liposome and its preparation method and application for improving therapeutic index and drug property by reducing the gastrointestinal toxicity of the toad tryptamine. The invention assumes an active drug loading method to prepare a liposome preparation, the liposome preparation comprises liposome particles, the liposome particles comprise a carrier, the carrier is a liposome membrane with a bimolecular structure, and the bufotenine comprises serotonin, bufotenine, the liposome has been prepared with toad tryptamine,

phospholipid, cholesterol and vitamin E. The liposome of toad tryptamine has been used for treating pain, inflammation and depression.

Fat cell targeted transmembrane transport liposome drug carrier (CN114288250A) [9](2.5)

The invention provides a high-efficiency fat cell targeted trans membrane transport liposome drug carrier and a preparation method and application thereof. The invention combines the liposome modified and modified by hyaluronic acid with the liposome modified and modified by adipocyte targeting peptide for the first time, and the two modification modes synergistically improve the targeting effect of the liposome drug carrier on the adipocyte. According to the invention, the entrapment efficiency of the liposome on macromolecular protein and nucleic acid is improved by virtue of the oligo-lysine modified cationic lipid molecules.

Ophthalmic Cetirizine hydrochloride liposomal in-situ gel (CN114392235)[10](2.6)

Current invention of cetirizine hydrochloride ophthalmic liposome, in-situ gel, preparations. In order to overcome the defects that the existing cetirizine hydrochloride eye drops have short retention time and poor semi-solid dosage form compliance, cause low bioavailability and are not easy to be accepted by patients, the invention adopts an ethanol injection method and an ammonium sulfate gradient method to obtain liposome, encompass cetirizine hydrochloride, phospholipid, cholesterol, osmotic pressure regulator, bacteriostatic agent and solvent. The obtained Cetirizine hydrochloride in-situ gel for ophthalmic administration can delay the release of the medicament, increase the residence time of eyes, improve the permeability of cornea and improve the bioavailability.

Hydrophobic drug nanocrystal (CN114306639A) [11](2.7)

The invention gives a hydrophobic medication nanocrystal / siRNA co-stacked arranged structure lipid nano preparation, and a preparation method and application thereof. The lipid nano preparation has a three-layer requested structure, wherein a center layer is hydrophobic medication Nano crystals, a center layer is a co-stacked siRNA, and a peripheral layer is a lipid bilayer membrane and practical changed particles. The lipid nano preparation can successfully stack nucleic acid drugs like hydrophobic drugs, siRNA and such, has requested and stable structure and great biocompatibility, can further develop the disintegration pace of the stacked hydrophobic drugs, advances the arrival of the stacked hydrophobic drugs from the preparation, is positive for rapidly arriving at the activity concentration of the drugs, and gives another preparation to the consolidated conveyance and treatment of the hydrophobic drugs and the quality drugs of related diseases. Hydrophobic medication nanocrystal co-stacked arranged structure lipid nano preparation as well as preparation method and application.

Targeted composite carrier & drug-loading system (CN114432248B) [12](2.8)

The invention discloses a targeted composite carrier, a medication stacking framework, a preparation technique and application thereof. The composite carrier comprises a first targeting carrier and a second targeting carrier, wherein the first targeting carrier comprises the accompanying parts: dioleoyl phosphatidylethanolamine, lecithin, cholesterol succinate monoester, cholesterol, imidazolyl cholesterol, and DSPE-Stake HA; the DSPE-Stake HA is prepared by passing DSPE-Stake NH2Is prepared by mixing hyaluronic acid; the imidazolyl cholesterol is prepared from chloroformic acid cholesterol and N-(3-aminopropyl) imidazole; the second targeting vector comprises the accompanying parts: a compound phospholipid and glycocholic acid, wherein the compound phospholipid comprises lecithin and DSPE-Stake GA; the molecule size of the first targeting vector is 150 nm-200 nm; the molecule size of the second targeting carrier is 25-50 nm. The invention controls the tumor microenvironment and kills the tumor cells in a targeted manner by stacking the drugs through various targeted carriers, accomplishes the impact of synergistic enemy of tumor and tackles the issue of tumor drug resistance created by long-term treatment of a drug.

Magneto liposomes as hyperthermia agent (US20030211045A1)[13] (2.9)

The current expertise deals with magneto liposomes, a procedure for finding these magneto liposomes and their use as a hyperthermia agent, in the release of drugs, such as antimicrobials and antineoplastic, and in diagnosis.

Improved magnetically reactive vesicular bodies (EP0842042A4)[14] (2.10)

A method of preparing a vesicular particle having at least in part a lipid and/or polymeric membrane that is a barrier between the interior and exterior of the vesicular particle, wherein the membrane includes at least one inorganic core nanoparticle embedded in the membrane, the method includes the steps of i) providing a first dispersion with one or more inorganic core particles having a hydrophobic dispersant shell, in a solution of membrane forming lipids and/or polymers in a non-aqueous solvent; and ii) introducing the first dispersion into a non-solvent for the membrane forming lipids and/or polymers, wherein the volume of the non-solvent exceeds the volume of the first dispersion, thereby forming the vesicular particles; the produced particle preparations and their uses. The current invention relates to the field of nanoparticles embedded in membranes or coatings in vesicular structures.

Nanoparticle containing capsules have been proposed for many uses, including triggered drug delivery and imaging. Combining super

paramagnetic iron oxide nanoparticles (SPIONs) with existing liposome drug delivery technology is an enticing prospect, but it requires efficient methods of synthesis and formulation compatible with pharmaceutical applications.

Mam C-mediated biomimetic magnetic nanoparticles (KR102238816B1)[15](2.11)

The present invention provides magnetite comprising super paramagnetic biomimetic nanoparticles, which can be manufactured by a scalable process. Furthermore, these nanoparticles have promising properties, since, if functionalized, they can become drug transporters or contrast agents for clinical imaging. They can be used in clinical settings also to purge bone marrow as well as molecule separators and/or in environmental applications as biosensors. These nanoparticles, attached with a drug, can be encapsulated in liposomes, obtaining magneto liposomes, which can be functionalized for use in the targeted administration/release of drugs. In addition, mixtures of magneto liposomes (both functionalized and non-functionalized with a targeting agent) and functionalized biomimetic magnetic nanoparticles or liposomes containing mixtures of functionalized BMNPs and MNPs can be used to combine different treatments such as targeted administration/release of drugs and hyperthermia.

CONCLUSION

At this juncture, liposomal drug delivery system has gained attention towards the researchers for targeting the drugs for various reasons like, increasing bioavailability, reducing dose frequency, avoiding systemic effects by targeting the site required for act upon etc., Especially, targeting magneto liposomes to the specific site of action, has gained a momentum as it has been reliable and trustworthy. Henceforth, we could attain a conclusion from this review that, liposomal drug delivery has been a promising source of drug delivery as far as the portfolio of targeted drug delivery is concern.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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