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A REVIEW ON NOVEL DRUG DELIVERY SYSTEM

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ABSTRACT

The transdermalroute of administration has numerous advantages over more traditional routeof medicine.Recent development in novel drug system of herbal is theexternal subcaste ofthe skin,the stratum corneum. therefore, exploration to ameliorate transdermal medicine delivery(TDD) is worthwhile this subcaste is the areaof interest. This review composition is written to give content commentary recent advances in TDDS enhancement ways. ways that ameliorate the permeability ofthe skinhave been used developed to ameliorate bioavailability and increase the choice oftopical and transdermal medicines is a feasible option. This review describes improvement ways grounded on medicine/ vehicle optimization,e.g selection of medicines, prodrugs and ion dyads, supersaturated medicine results, eutectic systems, complexes, liposomes, vesicles and patches. Strengthening by changing the shell withmoisturizing chemical enhancers partitioning and solubility goods affecting crustal lipidand keratin structure bandied Medium of action of penetration enhancers and retardersand they're implicitfor clinical use operation is described.

KEYWORDS: *New drug delivery system, Phytosome, Nanoparticles, Microsphere, Transdermal Drug Delivery System Carriers, Colloidal drug carriers.*

INTRODUCTION

A novel drug delivery system is a new approach that utilizes new technologies, innovative ideas, and methodologies to deliver the active molecules in safe yet effective concentration to produce desired pharmacological action. It is a formulationor device that deliver as drug to a specific site in the body at a specific rate. Novel substances are novel, or new, substances not previously identified by drug experts andinclude illicit drugs and counter felt prescription medications. A novel drug delivery system plays important role to enhancing therapeutic efficacy, reducing toxicity,increasing patient compliance and enabling entirely new medical treatments.The various routes of NDDS include oral, parenteral (injected),sublingual, topical, transdermal, nasal, ocular, rectal, and vaginal, however drug delivery is notlimited tothese routes and there may be several ways to deliver medications through other routes. There are several different carriers with benefits over made on the basis typesin the novel drug delivery systems (NDDS). The traditional dosage forms display high dose and low availability, instability, first pass effect, fluctuation of plasma drug levels,and fast release of medicinal products. By-performance, protection, compliance with patients, and product shelf life. NDDS will mitigate the problems. Becoming aware of the potential effects on human health and environmental sustainability and due to thegrowled environmental performance of humanmade nanoparticles, nanoparticles are of current interest. In several different applications, nanoparticles are used and generated by various processes. Interesting theoretical problems are their calculationand characterization. Nanoparticles are classified as nanoparticles with a diameter between 10 and 100 nm. Their pharmacodynamics and pharmacokinetic properties aremodified as a targeted supply mechanism for the distribution of small and large molecules. They can be characterized as system containing dissolved active agent, encapsulated or adsorbed in the matrix material used to deliver the target tissue. Theeffect of medication on the target tissue has been shown to increase the retention stability by enzymes and intravascular solubilization of nanoparticles. During the designof nanoparticles, some controls need to be vigilant,including the release pattern, dimensions and surface characteristics, which decide the particular site action at optimum rates with a right dose scheme. The first nanoparticles documented were based on a polymeric non- biodegradable frame work (polyacrylamide, polymethylmethacrylate, polystyrene). The polymeric nanoparticles may holdpharmaceuticals or proteins. These bioactive are trapped as particulates or solid solutions in the polymer matrix, or they may be physically or chemically stuck to the surface of the particle. The medicine(s) may be applied to the previously prepared nanoparticles in the preparation of nanoparticles. This term does not reflect the morphological or structural organization of the system and is are suggestively general.Nano medicine is an innovative field of medicine.

ADVANTAGES OF NOVEL DRUG DELIVERY SYSTEM

1. Protection from physical and chemical degradation.
2. Sustained delivery.
3. Improved tissue macrophages distribution.
4. Enhancement of stability.

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5.Enhancement of pharmacological activity.
6.Protection from toxicity.
7. Increased bioavailability
8.Enhancement of solubility

RECENT DEVELOPMENTS IN NOVEL DRUG DELIVERY SYSTEM OF HERBALS

1.Phytosome
2.Liposome
3.Nanoparticles
4.Emulsions
5. Microsphere
6. Ethosome
7. Solid lipid nanopartical8.Niosomes 9.Proniosomes
10.Dendrimers 11.Liquid Crystals12.Hydrogels

1. Phytosome

Phytosomes are lipid compatible molecular complex which are composed of "phyto" which means plant and "some" meaning cell-like . Complexing the polyphenolic phytoconstituents in the molar ratio with phosphatidyl choline results in a new herbaldrug delivery system, known as "Phytosome". Phytosomes are advanced forms of herbal products that are better absorbed, utilized to produce better results than those produced by conventional herbal extracts. Phytosomes show better pharmacokineticand therapeutic profiles than conventional herbal extracts

- **Advantage of Phytosome**

1. Phytosome increases the absorption of active constituents, so its dose size requiredis small.
2. There is appreciable drug entrapment and improvement in the solubility of bile to herbal constituents, and it can target the liver.
3. In Phytosome, chemical bonds are formed between phosphatidylcholine molecules, so it shows good stability
4. Phytosome improves the percutaneous absorption of herbal phytoconstituents

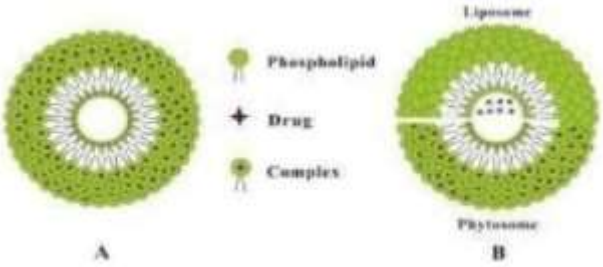


Figure. 3. liposome & Phytosome

2. Liposome

Tiny pouches made of lipids, or fat molecules surrounding a water core widely used forclinical cancer treatment. Several different kinds of liposomes are widely employed against infectious diseases and can deliver certain vaccines. During cancer treatment they encapsule drugs, shielding healthy cells from their toxicity, and prevent their concentration in vulnerable tissues such as those of patient kidneys and liver. Liposomescan also reduce or eliminate certain common side effects of cancer treatment such as nausea and hair loss.

They are form of vesicles that consist either of many, few or just one phospholipid bilayers.
The polar character of liposomal core enables polar drug molecules to be encapsulated.Amphiphilic and lipophilic molecules are solubilized within phospholipid bilayer according to their affinity towards phospholipids.

- **Advantages of liposome**

1. The high biocompatibility.
2. The easiness of preparation.

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3. The chemical versatility that allows the loading of hydrophilic, amphiphilic, and lipophilic compounds. The simple modulation of their pharmacokinetic properties bychanging the chemical composition of the bilayer components

Uses of Liposome

Another major and important advancement in the novel drug delivery systems is the use of liposomes for carrying the drugs to the site of action. Liposomes in both modified and unmodified forms are able to change the course of pharmacokinetic parameters of the drugs. These are widely used in delivering the cytotoxic agents to the tumour tissue and preventing side effects like myelosuppression. These are also used in targeting through receptor-mediated endocytosis. Modified liposomes also have huge applications in targeting various drugs to the organs like heart, liver, kidney,lungs and bones

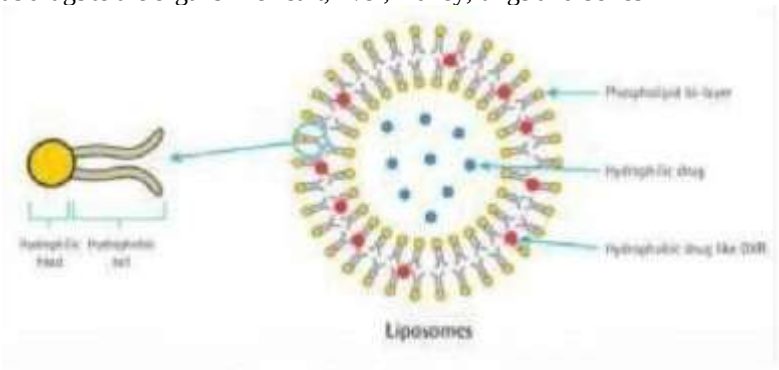
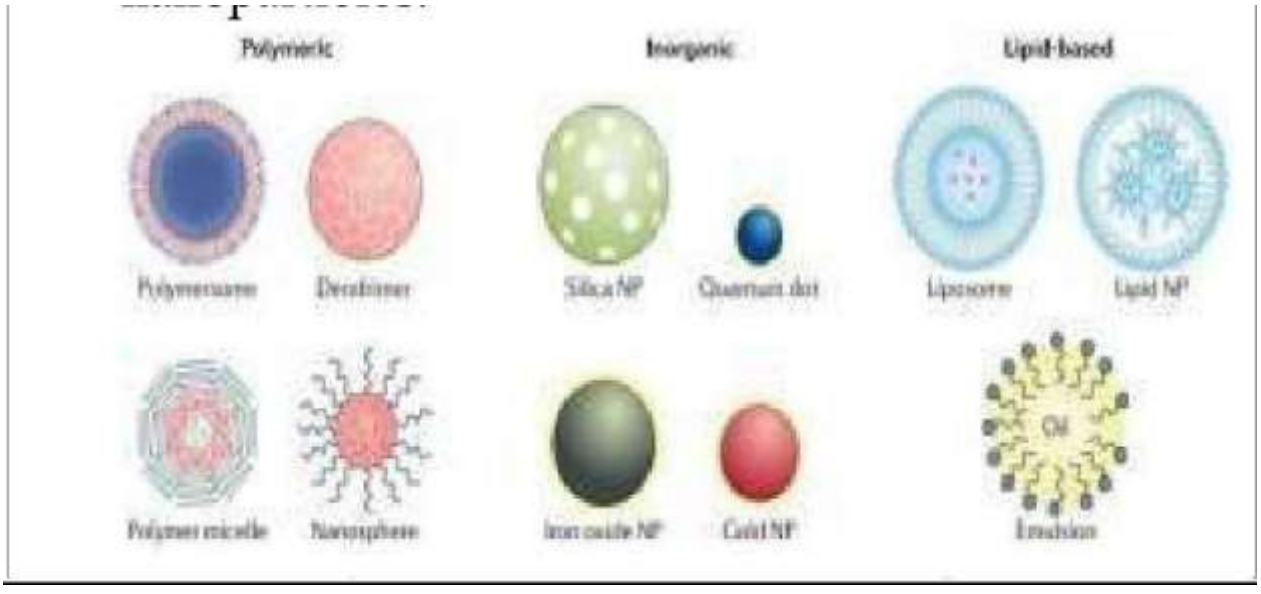


Figure 4. Liposomes

3. Nanoparticals

Nanoparticles (including nanospheres and nanocapsules of size 10-200 nm) are in the solid state and are either amorphous or crystalline. They are able to adsorb and/or encapsulate a drug, thus protecting it against chemical and enzymatic degradation. In recent years, biodegradable polymeric nanoparticles have attracted considerable attention as potential drug delivery devices in view of their applications in the controlled release of drugs, in targeting particular organs / tissues, as carriers of DNAin gene therapy, and in their ability to deliver proteins, peptides and genes through theperoralroute.



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- **Advantages of Herbal Nanoparticle Delivery System**

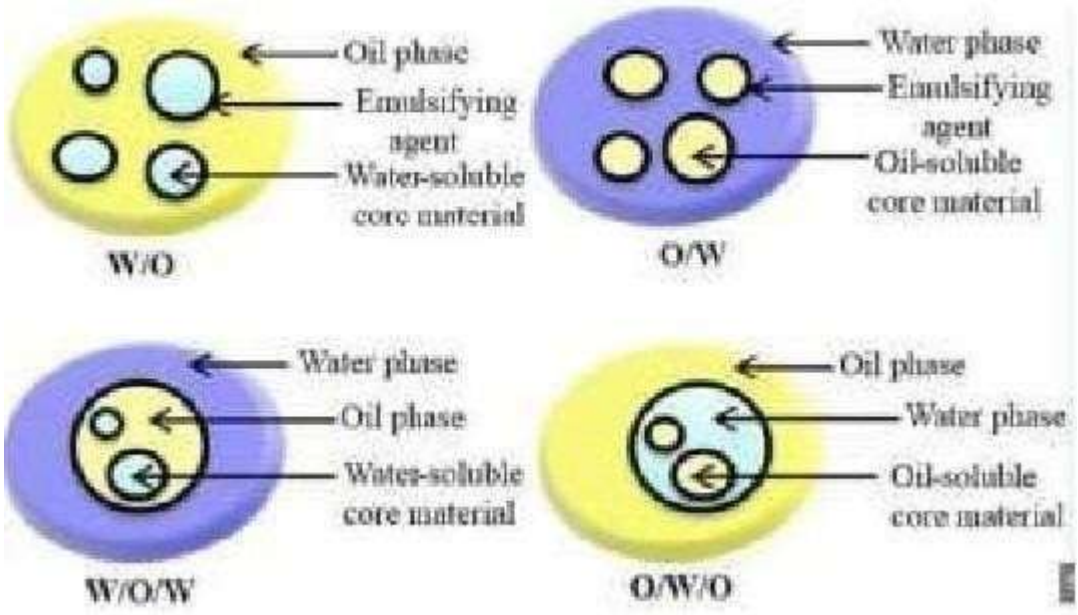
1.Nanoparticulate system delivers the herbal formulation directly to the site of action.2.Increased efficacy and therapeutic index.
3.Increased stability via encapsulation.4.Improved pharmacokinetic effect.
5.Producible with various sizes, compound surface properties.

4. Emulsion

Emulsion is a biphasic system in which one page intimately disperse in other page in form of minute droplet in ranking in diameter from 0.1um to 100um. In emulsion,one page is always water or aqueous page and the other page is oily liquid,that is non aqueous. Among them, the micro emulsion is also called Nano emulsion, and sab microemulsion is called liquid emulsion. Micro emulsion is a clear, the thermodynamically, stable, frequency in combination with a cosurfactant.

- **Advantages of Emulsion-Based Formulations**

1. It can release the drug for a long time because it is packed in the inner phase and makes direct.
2. contact with the body and other tissues.
3. As a result of the lipophilic drugs being made into o/w/o emulsion, the droplets of oil are phagocytosised by macrophages and increase its concentration in liver, spleenand kidney.
4. As the emulsion contains herbal formulation, it will increase the stability of hydrolyzed formulated material and improve the penetrability of drug into skin and mucous.
5. The new type, viz., Elemenum emulsion, is used as an anti-cancer drug and causes no harm to the heart and liver



5. Microshpere

Microsphere comprises of small spherical particles, with diameters in the micrometer range, typically 1 μm to 1000 μm (1 mm). Microspheres are sometimes referred to as micro- particles. Microspheres can be manufactured from various natural and synthetic materials. Glass microspheres, polymer microspheres and ceramic microspheres are commercially available. Microspheres are classified as biodegradable ornonbiodegradable. Biodegradable microspheres include albumin microspheres, modified starch microspheres, gelatin microspheres, polypropylene dextranmicrospheres, polylactic acid microspheres, etc. According to the current literature reports on nonbiodegradable microspheres, polylactic acid is the onlypolymer approved to be used by people, and it is used as a controlled-release agent. Solid and hollow microspheres vary widely in density and therefore are used for different applications.

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6. Ethosome

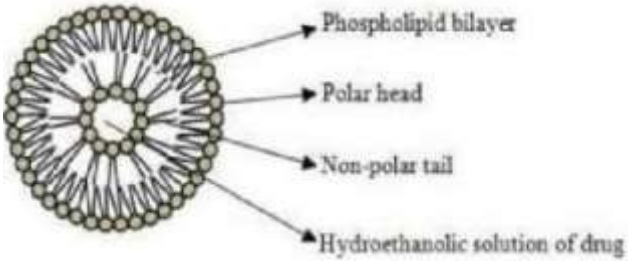
Ethosomes are developed by mixture of phospholipids and high concentration of ethanol. This carrier can penetrate through the skin deeply lead to improve drug delivery into deeper layer of skin and in blood circulation. These formulations are useful for topical delivery of alkaloids in form of gel and cream for patients comfort. They show increase in their permeability through the skin by fluidizing the lipid domainof the skin. Unstable nature and poor skin penetration are limits for Ethanosomes tropical delivery. The Ethosomes was developed and examined for their ability the topical absorption of Tetrandine through dermal delivery, and the relation of formulations to the pharmacological activity of Tetrandrine loaded in the formulationwas also accessed. Result of the drug levels in rat plasma showed that when Tetrandrineloded Ethosomes were topically administered in rats the drug level was lowto be detected in rat plasmaIn conclusion, Ethosomes were demonstrated to be promising carrier for improving topical delivery of Tentrandrine via skin

- **Advantages of Ethosomal Drug Delivery**

1. Ethosomes are a platform for the delivery of large amounts of diverse groups ofdrugs.
2. Ethosomaldrud is administered in semisolid form resulting in Improvement in patientscompliance

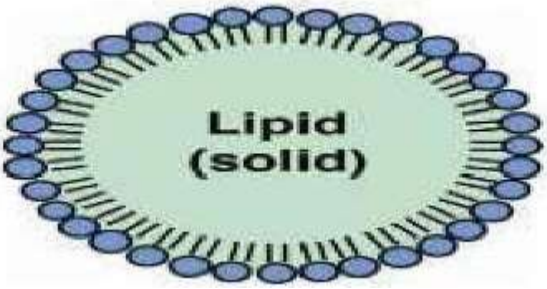
7. Solid Lipid Nanoparticles

(SLNs) are a new pharmaceutical delivery system or pharmaceutical formulation.



The conventional approaches such as use of permeation enhancers, surface modification, prodrug synthesis, complex formation and colloidal lipid carrier based strategies have been developed for the delivery of drugs to intestinal lymphatics. In addition, polymeric nanoparticles, self-emulsifying delivery systems, liposomes, microemulsions, micellar solutions and recently solid lipid nanoparticles (SLN) have been exploited as probable possibilities as carriers for oral intestinal lymphatic delivery.

A solid lipid nanoparticle is typically spherical with an average diameter between 10 and 1000 nanometers. Solid lipid nanoparticles possess a solid lipid core matrix that can solubilize lipophilic molecules. The lipid core is stabilized by surfactants (emulsifiers). The term lipid is used here in a broader sense and includes triglycerides (e.g. tristearin), diglycerides (e.g.glycerolbahenate), monoglycerides (e.g. glycerol monostearate), fatty acids (e.g. stearic acid), steroids (e.g. cholesterol), and waxes (e.g. cetyl palmitate). All classes of emulsifiers (with respect to charge and molecularweight) have been used to stabilize the lipid dispersion. It has been found that the combination of emulsifiers might prevent particle agglomeration more efficiently.



8. Ninosome

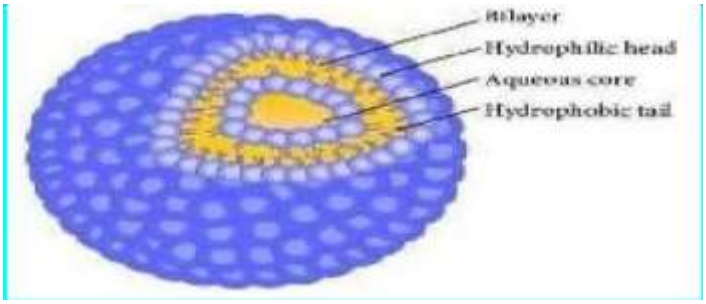
Niosomes are multilamellar vesicles formed from non-ionic surfactants of the alkyl or dialkyl polyglycerol ether class and cholesterol. Earlier studies, in association with L'Oreal have shown that, in general, niosomes have properties as potential drug carriers

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similar to liposomes. Niosomes are different from liposomes in that they offer certainadvantages over liposomes

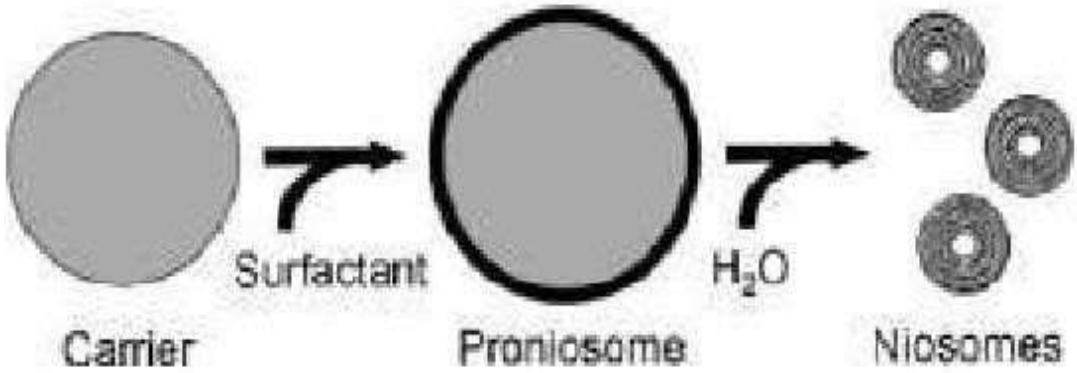
Types of Niosomes

1. Niosomes are classified based on number of bilayers,
2. Size and method of preparation.
3. Multilamellar-0.5µmto10µmindiameter.
4. LargerUnilamellar-0.1µmto1µmindiameter
5. Small Unilamellar–25-500nm in diameter.



9. Proniosomes

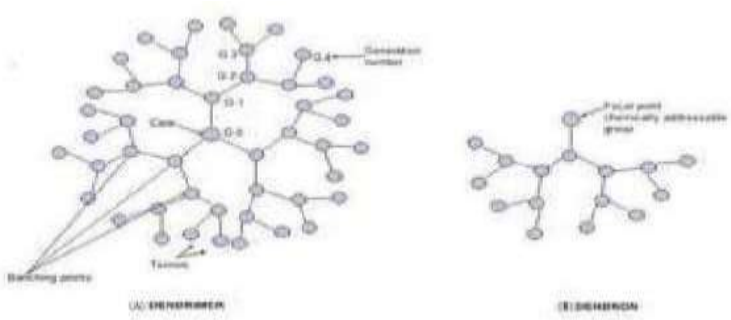
Pronanosome gel system is step forward to ninosome, which can be utilized for various applications in delivery of actives at desire site. Proniosomal gels are theformulations, which on in situ hydration with water from the skin are converted into niosomes .



10. Dendrimers

are precisely defined, synthetic nanoparticles that are approximately 5–10 nm in diameter. They are made up of layers of polymer surrounding a control core. The dendrimers surface contains many different sites to which drugs may be attach and also attachment sites for materials such as PEG which can be used to modified the way of dendrimer which interacts with body. PEG can be attached to dendrimer to 'disguise' it and prevent the body's defense mechanism for detecting it, there by slowing the process of break down. This fascinating particle holds significant promisefor cancer treatment. Its many branches allow other molecules to easily attach to itssurface. Researchers have fashioned dendrimers into sophisticated anticancer machines carrying five chemical tools–a molecule designed to bind to cancer cells, a second that fluorescence upon locating genetic mutations, a third to assist in imagingtumor shape using x–rays, a fourth carrying drugs released on demand, and a fifth thatwould send a signal when cancerous cells are finally dead. The creators of these dendrimers had successful tests with cancer cells in culture and plan to try them in living animals soon

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11. Liquid Crystal

Liquid Crystals combine the properties of both liquid and solid states. They can be made to from different geometries, with alternative polar and non-polar layers (i.e., a lamellar phase) where aqueous drug solutions can be included

12. Hydrogels

Hydrogels are three-dimensional, hydrophilic, polymeric networks capable ofimbibing large amounts of water or biological fluids. They are used to regulate drug release in reservoir-based, controlled release systems or as carriers in swellable and swelling-controlled release devices.

OBJECTIVE

1. Provide an exhaustive overview of existing conventional drug deliver systems.
2. Focus on advancements in nanotechnologybased drug delivery systems.
3. Assess the impact of these innovations on drug stability, solubility, and bioavailability.
4. Examine the applications of novel drug delivery systems in specific therapeuticareas, such as oncology, neurology, and infectious diseases.
5. Assess the significance of biodegradable and sustained release drug delivery systems.
6. Analyze the impact of novel drug delivery systems on patient convenience andcompliance.

CONCLUSION

Novel Drug delivery System (NDDS) is a combination of advance techniques and newly designed dosage forms which are much better than conventional dosage forms. Advantages of Novel Drug Delivery System are Optimum dose at the right time and right location, Efficient use of expensive drugs, excipients and reductionin production cost, Beneficial to patients, better therapy, improved comfort and standard of living. Basic modes of novel drug delivery systems are: Targeted Drug Delivery System, Controlled Drug Delivery System etc. Novel Drug delivery & drug targeting is new techniques which is used in pharmaceutical science. Like targeting drug molecules, vaccine delivery, Gene therapy, commercial development of novelcarries (liposomes). Pharmaceutical innovations like the Novel Drug Delivery Systems presents health professionals with a broad range of arsenals to treat diseases with never before efficacy, safety and precision. Clinically the NDDS not only smoothens the saw-tooth pattern of drug levels in blood, but also affords targeting the drugs to their site of action and thus reduces dose-related side effects. Smaller quantity of drug and fewer numbers of dosing could be used to treat a disease with increased success. It is hoped that with more and more research endeavors being focused into this arena, in near future, a large portion ofthe conventional dosage forms would be replaced by these NDDS and an overall betterment of health care delivery is expected with that change over. Pharmaceutical companies are interested to conduct research on NDDS to get edgeover the big pharmaceutical companies to capture the regulated market through ANDA in regulated market. Moreover, development and implementation of new branches like Pharmacovigilance will ensure availability of safer medicines to our people.

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