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MICROSPHERES: A VERSATILE DRUG CARRIER IN NOVEL DRUG DELIVERY SYSTEM

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ABSTRACT:

Novel drug delivery system plays a pivotal role in delivering the therapeutic drug candidate to the target site to elicit the biological response with a sustained and controlled fashion. The recent advances in molecular biology, genomics, and combinatorial technology speed up the drug discovery process to produce the novel compounds in en masses. But these new molecules pose the pharmacokinetic obstacles in laboratory such as low solubility and poor stability etc. The conventional drug delivery system leads to several problems and those are overcome by controlled release formulation. With this objective, this paper deals with microscope formulation and its advantages since microsphere is unity of the important advanced targeted drug delivery system. The microspheresare solidpowders for free flowing, which composed of proteins or synthetic polymer which are highly biodegradable.They have particle size in range between 1um-1000um that can be delivered by several routes like oral, parenteral, nasal, ophthalmic, transdermal,colonal etc.this review article describes the basic principle of microsphere formulation, methodology of preparation, application in pharmaceutical sciences.

Keywords: Microspheres, Novel drug delivery, Biodegradable polymer, Therapeutic efficacy.

INTRODUCTION:

Drug delivery systems are engineered technologies play vital role to deliver the drug at target site. The novel drug delivery systems control the drug delivery rateand prolong the release phenomena. [1] The controlled drug delivery system provides several advantages over the conventional system. For example, tailored drug release rate, protection from metabolic degradation and enhanced patient compliance.

MICROSPHERES:

- Microspheres also referred as micro particles have the diameter range of 1-1000micrometer. They act as versatile drug carrier to deliver the drug to the target site in a control and sustained fashion.
- Microspheres are prepared by various methods like single and double emulsification method, solvent evaporation method, and spray drying method and phase separation methods.
- Generally, the microspheres are prepared by dissolving the drug material into primary volatile solvent which is subsequent dispersed into a secondary solvent that is immiscible with primary one.
- The complete evaporation of the primary solvent results fine powder of microsphere which is adequately water soluble. .[2,3]

TYPES OF POLYMERS:

Microspheres can be prepared by using both biodegradable and non-biodegradable substances. These materials include polymers which are categorized into two types:

1. Synthetic polymer
2. Natural polymer

1. Synthetic polymers: they are acts as carrier materials and divided in to two types namely

1. Biodegradablepolymers: for ex- Lactides and Glycolides and their co-polymers, Poly alkyl cyano acrylates, poly anhydrides.

2. Non- Biodegradable polymers: for ex- Poly methyl methacrylate, Acrolein, Epoxy polymers, Glycidyl methacrylate.

2. Natural polymers: They are obtained from different sources like proteins, carbohydrates, and chemically modified carbohydrates.

(A) Proteins e.g.: Albumin, Gelatine, and Collagen

(B) Carbohydrates: e.g.: Agarose, Gelatine, Starch, Chitosan, Carrageenan.

(C) Chemically modified carbohydrates: Poly (acryl) dextran, Poly (acryl) starch, DEAEcellulose. [4]

PRE REQUISITES FOR IDEAL MICRO PARTICULATE CARRIERS:

Materials used for the development of microparticulates should have the following characteristics:

- Prolonged action
- Control of drug content release
- Increase the therapeutic efficacy
- Elimination of toxicity
- Protection of drug
- Sterilizability
- Biocompatibility

- Water solubility or dispersibility
- Target ability [4,5]

MERITS OFMICROSPHERES OVER CONVENTIONAL DOSAGE FORMS:

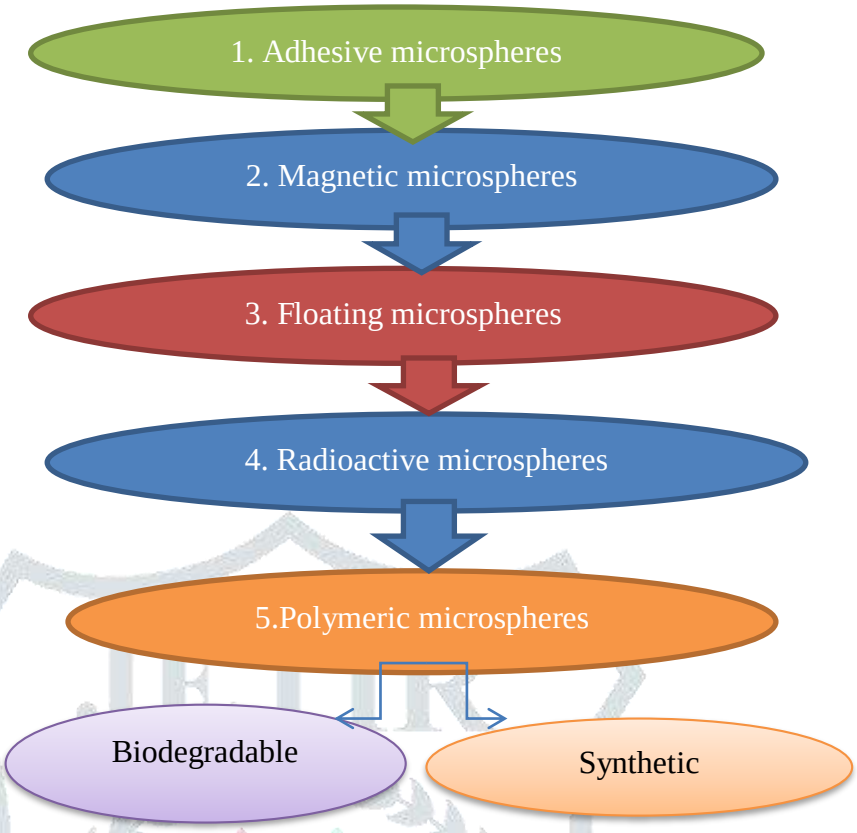
- Microsphere provides constant and prolonged therapeutic effect.
- Aid in conversion of oils and other liquids to solids for ease of handling.
- Aid in dispersion of water soluble substances in aqueous media.
- Reduces the dosing frequency and there by improve the patient compliance.
- Protect the drug from enzymatic and photolytic cleavage hence found to be best for drug delivery.
- Microspheres bypass the first pass metabolism.
- Microspheres mask the taste and odour
- Provide the protection of GIT from irritant effects of drug.
- Controlled release biodegradable microspheres facilitate control drug release rates there by reduces toxic effects , and reduces the inconvenience of repeated injections.[6,7]

DEMERITS OF MICROSPHERES:

Few of the demerits were found to be as follows:

- Stability of encapsulated core particles may get influenced by process conditions like temperature
- Changes, PH, addition of solvent and evaporation.
- May produce modified release of drug from the dosage form
- The drug release depends on fate of polymer matrix and its side effects on the environment.
- Reproducibility is less.
- Drug release can be differ from one to another formulation
- Elimination of parentrally administered microsphere carriers is very difficult from the bodytotally [6,7].

TYPES OF MICROSPHERES:



1. Bio adhesive microspheres:

Bio adhesion microspheres are promoting adhesion property by using water soluble polymer which facilitate adhering of drug to the membrane and possess sticking property is called Bio adhesion. Adhesion of drug delivery devices to the mucosal membrane such as ocular, rectal, buccal, nasal etc. can be called as bio adhesion.

In controlled drug delivery system Bio adhesivemicrospheresranging from the small molecules to peptides and macromolecular drugs such as proteins even DNA.

Bio adhesive microspheres exhibit a continuous and prolonged residence time at the site of administration and lead to infinite contact with the absorption site and produce better therapeutic action.

Microspheres plays important role in particulate drug delivery system by advantage of their small size and good carrier capacity. [8-10].

2. Magnetic microspheres:

A magnetic microsphere plays important in localization of drug in disease site. In this huge amount of freely movable drug can be replaced by less amount of magnetically targeted drug. Magnetic carriers collectmagnetic responses to a magnetic field from incorporated materials (chitosan, dextran) that are used for the preparation of magnetic microspheres. Magnetic microspheres are prepared by mixing water soluble

drugs (for lipophilic drugs, along with the dispersing agents) and 10nm magnetite (Fe_3O_4) particle in an aqueous solvent of matrix material. This mixture is then emulsified in the oil. Ultra sonication and shearing is done to produce particles of suitable size range. The matrix is then stabilized by chemical cross linking or heating process. The different types of therapeutic magnetic microspheres and diagnostic microspheres (11-13).

- Therapeutic magnetic microspheres: it is used to deliver chemotherapeutic agents to liver tumour. Drugs like peptides and proteins can also be deliver through this system.
- Diagnostic microspheres: it is used as visualizing liver metastases and also can be used to differentiate bowl loops from different abdominal structures by resulting Nano size particles super magnetic iron oxides.

3. Floating microspheres:

Floating microspheres are a type of gastro retentive drug delivery system created on a non-effervescent approach. These are free flowing particles made up of natural proteins or synthetic polymers which are biodegradable in nature. They are invented to float on gastric juice with the specific density of less than one. This property results retard transit through the stomach. The medicament released slowly at desired rate, showing in better gastric retention with reduced alterations in plasma drug concentration. Solid biodegradable microspheres including a drug dispersed or dissolved all through the particle matrix have the probable for controlled release of drugs remains in stomach for longer period of time. [14]

4. Radioactive microspheres:

Radio labelled microspheres are very safe and have a shownefficacy in the field of primary as well as in treatment of Meta static cancers. Radioactive microspheres can be particularly targeted to various tumours without excessive radiation to the non-tumorous tissues. These are injected to halt tumour growth via the blood supply there by permit surgical removal once the tumour size reduced. Different kind of radioactive microspheres like α emitters, β emitters, γ emitters. [15, 16]

5. Polymeric microspheres:

The use of polymeric microsphere systems as vehicle for delivering drugs by variety of routes is considers with particular reference to parenteral administration. The different kinds of polymeric microspheres can be classifies as biodegradable polymeric microspheres and non-biodegradable polymeric microspheres.

- Biodegradable polymeric microsphere: Microspheres of biodegradable polymers were evaluated as a potential controlled release drug delivery system in the vitreous. The microspheres are formulated with polymers of poly (lactic acid) or copolymers of glycolic acid and lactic acid derivatives. Natural polymers such as starch are used because of their biodegradable, biocompatible, bio adhesive property. Biodegradable polymers prolong the contact time when comes in contact with the mucous membrane due to its high swelling property with aqueous medium which results in formulation of gel. Concentration of polymer can controls the release of drug.[17]
- Synthetic polymeric microspheres: synthetic microspheres find application in medical industry extensively. Microspheres are being used as bulking agents, embolic drug delivery particles. But the main demerits of

these microspheres are tending to migrate away from injection site and lead to potential risk, embolism and further organ damage.[18]

METHOD OF PREPARATION:

Incorporation of solid, liquid, gas in to one or more polymeric coatings can be done by microencapsulation techniques.[19].

The various methods are using for the preparation of different microspheres depends on particle size, route of administration ,duration of drug release and these above characters are relates to rpm, a method of cross linking , evaporation time, co-precipitation etc.[20]

Formulation of microspheres should justify certain criteria:

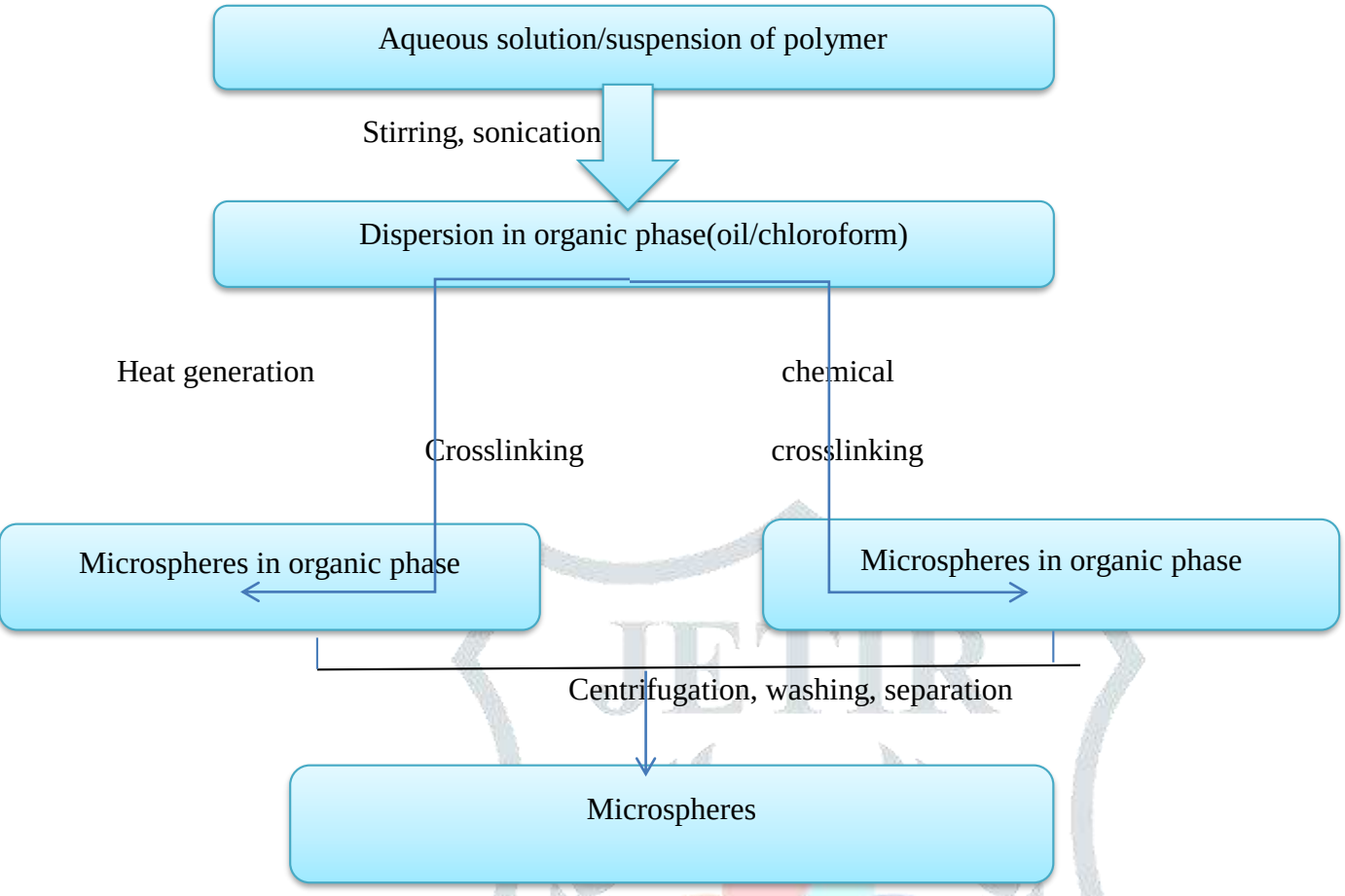
- High concentration of the drugs can be able to incorporate reasonably.
- Shelflife must be clinically acceptable for the stability of preparation after synthesis.
- Controllable particle size and dispensability in aqueous vehicle for injection.
- Active agent should release controllable with good control over an extensive time scale.
- Biocompatibility with a controllable biodegradability
- Susceptibility to chemical moderation.[21]

1. Single emulsion technique:

Single emulsion techniques are employed to formulate micro particulate carriers of various natural polymers like proteins and carbohydrates. The natural polymers are dissolved or dispersed in an aqueous medium subsequently dispersion in the non –aqueous medium e.g. oil. In the next step of preparation, cross linking of dispersed globule is achieved. The cross linking is achieved by two methods i.e. either by heat or using chemical cross linking agents including glutaraldehyde, formaldehyde, di-acid chloride, etc.[22,23,24]

- By heat: addition of dispersion into heated oil, but this method is not suitable for thermo liable drugs.
- By chemical cross linking agent: using glutaraldehyde, formaldehyde, acid chloride as cross linking agent .but it leads to excessive exposure.

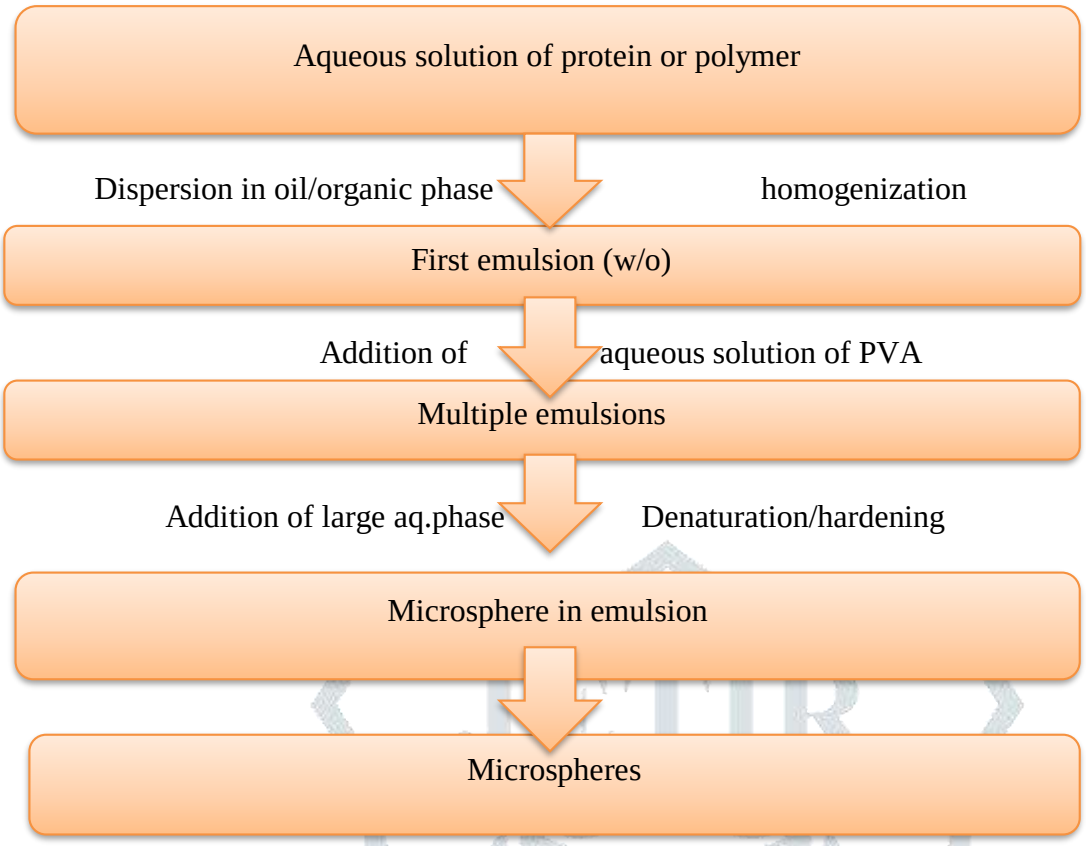
SINGLE EMULSION BASE METHOD



2. Double emulsion methods:

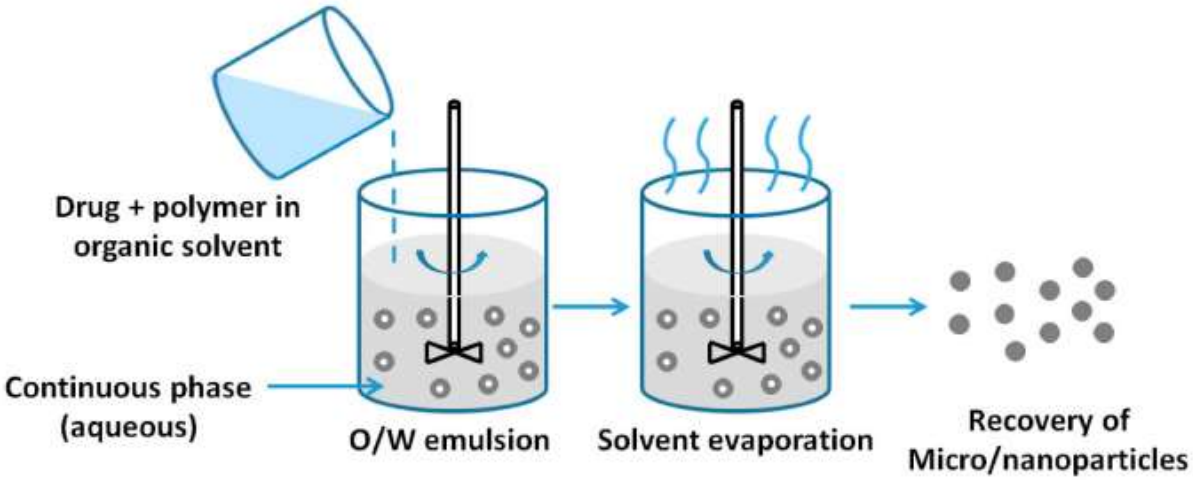
Multiple emulsions like w/o/w emulsion type are formulated by double emulsion methods, and preferred for water-soluble drugs, proteins, peptides and various vaccines. This method can be suitable for biodegradable and non- biodegradable polymers.

The aqueous protein solution is dissolved in a lipophilic oil continuous phase. This protein solution may contain the active compounds. The continuous phase is normally consists of the polymer solution that is eventually encapsulates of the protein contained in dispersed aqueous phase. The primary emulsion is then subjected to homogenization or the sonication prior addition to the aqueous solution of the poly vinyl alcohol (PVA). This results in the formation of a double emulsion. The emulsion is then subjected to solvent removal by solvent evaporation or by solvent extraction method. A number of hydrophilic drugs like luteinizing hormone releasing hormone (LH-RH) agonist, vaccines, proteins/ peptides and conventional molecules are successfully incorporated in to the microspheres using the method of double emulsion solvent evaporation/extraction.[25]



3. Emulsion solvent evaporation techniques:

This process is carried out in a liquid manufacturing vehicle. The microcapsule coating is dispersed in a volatile solvent which is immiscible with the liquid manufacturing vehicle phase.in this technique the drug is dissolved in the polymer which was previously dissolved in chloroform, and the resulting solution is added to an aqueous phase containing 0.2%sodium of PVP as an emulsifying agent. The above mixture was agitated at 500 rpm then the drug and polymer (eudragit) were transformed in to a fine droplet which solidified in to rigid microspheres by solvent evaporation and then collected by filtration and washed with demineralized water and desiccated at room temperature for 24hrs.[26]



4. Spray drying method:

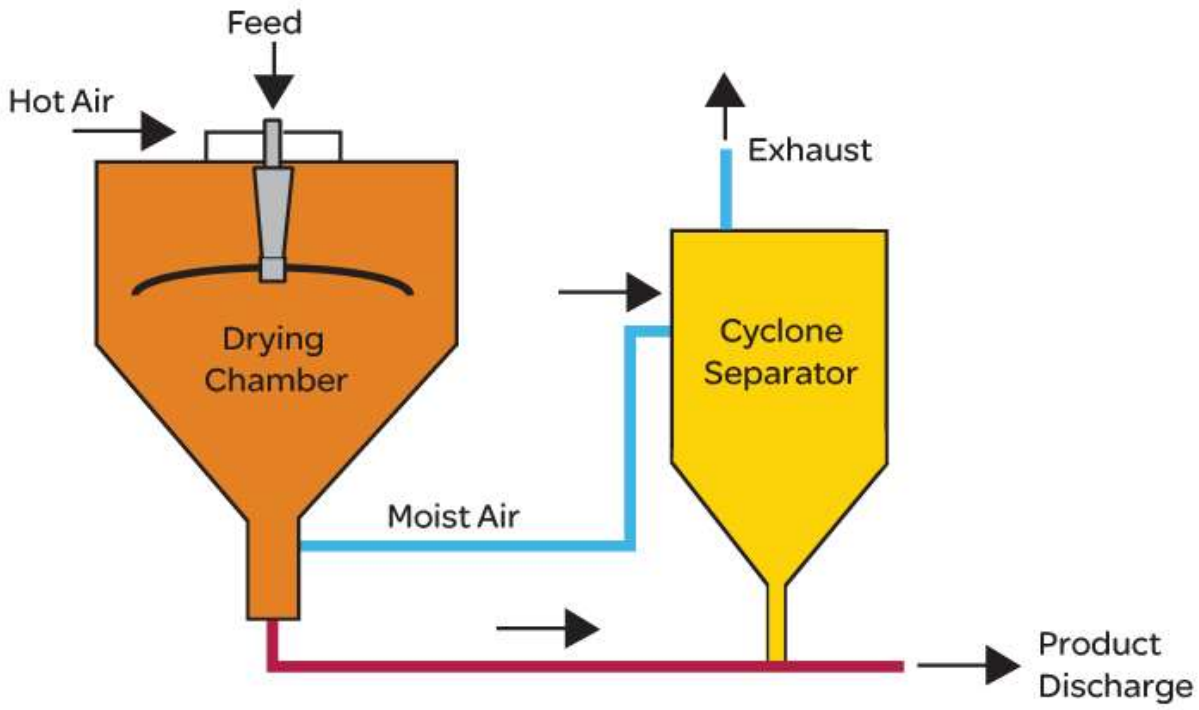
Spray drying is an instant and continuous solvent evaporation process of a liquid feed, atomises in a heated gas, generating a final dried solidified particles. The heated drying gas moves in co-flow with the atomised feed in the process chamber where the gas transfer its heat energy to the droplets and absorbs the solvent from the droplets. The humidifies cooled gas transports the particle to a cyclone, separating the final particles from the gas. By spray drying particles can be engineered to a specific size, shape and function by formulating the liquid feed and designing the process. Spray drying plays important role in solubility enhancement, encapsulation taste masking, modified release, inhalation, flow ability improvement, physic-chemical stabilization.

Principle: three steps involved in spray drying:

a) Atomization: of liquid feed change in to fine droplets.

b) Mixing: it involves the passing of hot gas stream through spray droplets which result in evaporation of liquids and leaving behind dried particle.

c) Dry: Dried powder is separated from the gas stream and collected.[21]



5. Polymerization methods:

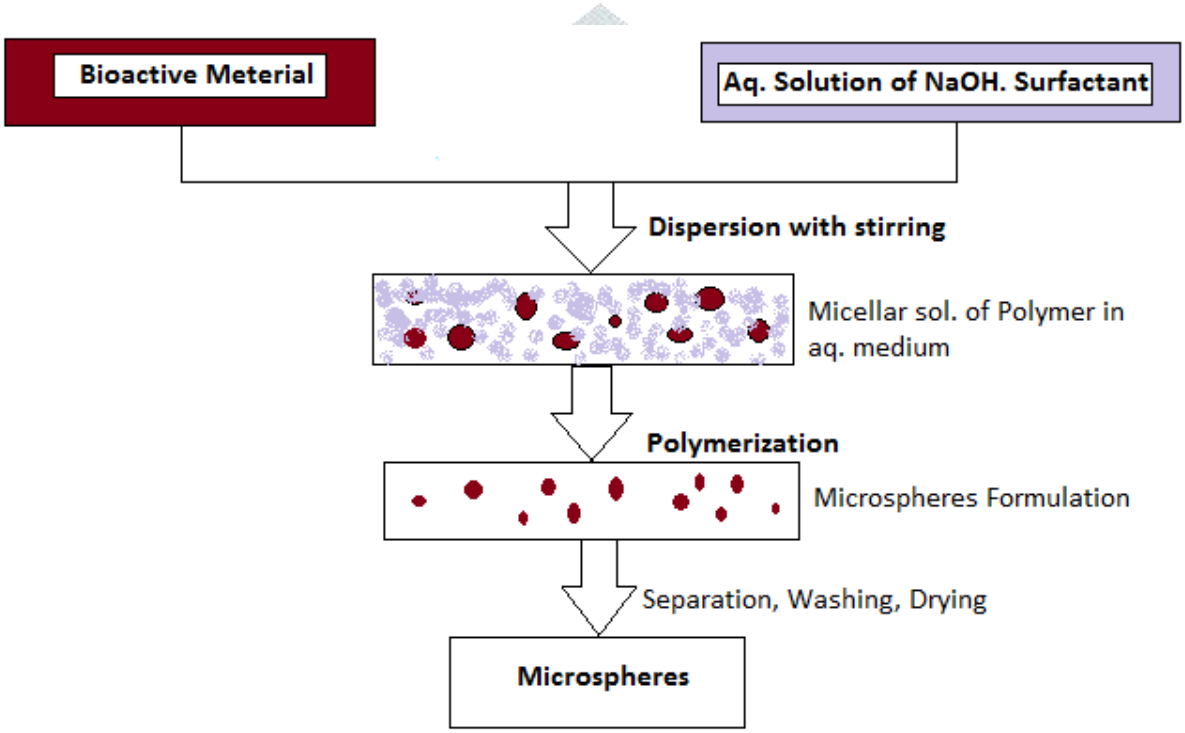
The polymerization takes place inside the droplet and product formed being insoluble In water. The product separated out in the form of spherical forms or beads of polymer. Hence this techniques is also known as Pearl polymerization / Granular polymerization/Bead polymerization

Microspheres are generally prepared by polymerization method mainly classifies as:

- Normal polymerization
- Interfacial polymerization

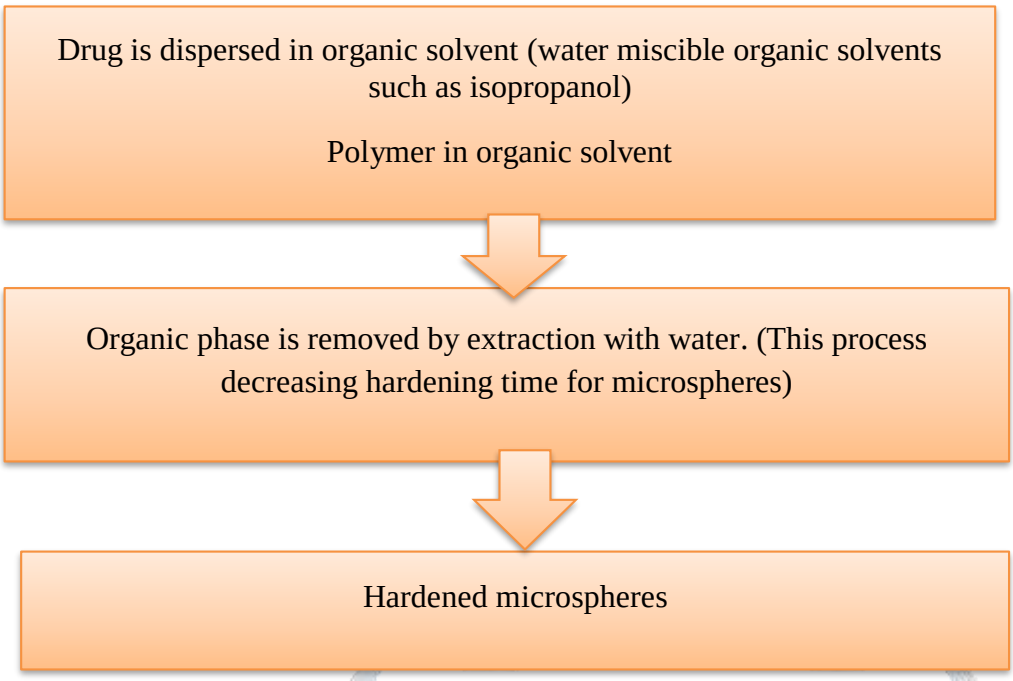
Both are carried out in liquid phase

- Normal polymerization: This method is carried out by using different techniques as bulk, suspension, precipitation, emulsion, and micelle polymerization processes.in bulk , a monomer or mixture of monomers along with the initiator or catalyst is usually heated to initiate polymerization. Polymer so obtained may be moulded as microspheres. Drug loading may be done during the process of polymerization. Suspension polymerization also referred as bead or pearl polymerization. Here it is carried out by heating the monomer or mixture of monomers as droplets dispersion in continuous aqueous phase. The droplets may also contain an initiator and other additives. Emulsion polymerization differs from suspension polymerization as due to the presence of initiator in the aqueous phase, which later on diffuses to the surface of micelle. Bulk polymerization has an advantage of formation of pure polymers.
- Interfacial polymerization: It involves the reaction of various monomers at the interface between the two immiscible liquid phases to form a film of polymer that essentially envelops the dispersed phase.[27]



6. **Solvent extraction method**:

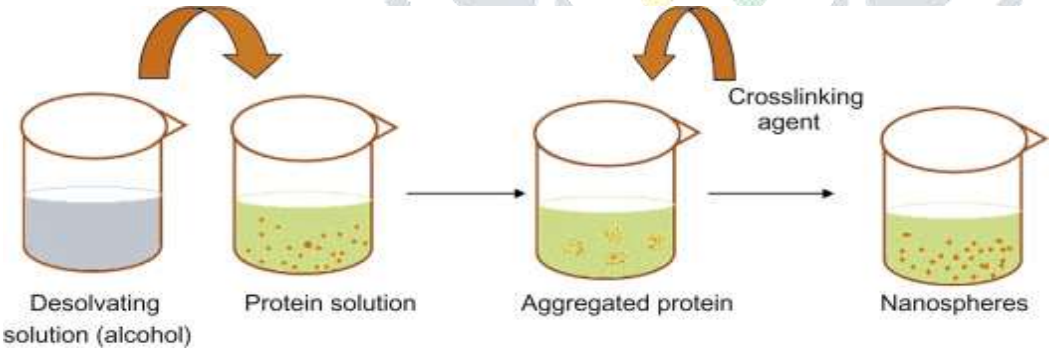
This method is employed for the preparation of microspheres, involves removal of the organic phase by extraction of organic solvent. This method involves water miscible organic solvents such as isopropanol. Organic phase is removed by extraction with water. This process decreases the hardening time for the microsphere.one variation of the process involves direct addition of the drug or protein to polymer organic solution. The rate of solvent removal by extraction method depends on the temperature of water, rate of emulsion volume to the water and solubility profile of the polymer. [28]



7. Phase separation coacervation method:

Coacervation phase separation refers partial desolvation of of a homogeneous polymer solution in to a polymer rich phase (coacervate) and the poor polymer phase (coacervation medium)

Coacervation involves the separation of a liquid phase of coating material from a polymeric solution and wrapping of that phase as a uniform layer around suspended core particles. Poly lactic microspheres have been prepared by this method by using butadiene as incompatible polymer. The process variables are very important since the rate of achieving the coacervates determines the distribution of polymer film, the particle size and agglomeration of the formed particles. [25]



8. Preparation of microspheres by thermal cross linking method:

Citric acid as a cross linking agent was added to 30ML of an aqueous acetic acid solution of chitosan (2.5% wt/vol) maintaining a constant molar ratio between chitosan and citric acid . The chitosan cross-linker solution was cooled to $O^{O}C$ and then added to 25ml of corn oil previously maintained at $O^{O}C$, with stirring for 2minutes, this emulsion was then added to 175ml of corn oil maintained at $120^{0}c$, and cross linking was performed in a glass beaker under vigorous stirring (1000rpm) for 40 minutes. The microspheres obtained were filtered and then washed with diethyl ether, dried and sieved. [25]

EVALUATION PARAMETERS:

The characterization of micro particulate system is an important phenomenon, which helps to design a suitable carrier for the proteins; drug or antigen delivery .in order to improve stability and drug release pattern evaluation studies must be done.

1. **Particle size and shape**:

The particle size and shape are very vital in formulation studies. They can be visualized by conventional light microscopy and scanning electron microscopy. These instruments are used to visualize the shape of the microsphere. The optical microscopy is used to study the particle size .The size of around 100 microspheres is measured and their average particle size is calculated.[27]

D mean =∑ n d/∑n

2. Percentage drugentrapment efficiency:

25mg of microspheres were crushed, dispersed in phosphate buffer as pH 6.8 with 20 meters sonication. After 6 Hrs magnetic stirring, the dispersion was filtered and the drug content was analyzed by U.V at 262 nm. The drug entrapment efficiency was calculated by the following equation drug

% Entrapment Efficiency = Practical Drug Content / Theoretical Drug Content x 100

3. In vitro release kinetics:

Kinetic models are fitted by drug release data of controlled release microspheres such as zero order, first order and Higuchi models to know the drug release pattern and mechanism. [29]

4. Surface morphology:

Scanning electron microscopy (SEM) under higher and lower resolutions is used for characterization of morphology of microspheres. [29]

5. Density determination:

The density is determined by multi volume pycnometer. A weighted quantity of the sample is place in pycnometer and introduced into to the chamber which is allowed to expand by the introduction of helium. The expansion of leads to depression of pressure and to consecutive reduction of pressure determines the density of micro sphere . [23,30]

6. Isoelectric Point:

Electrophoretic mobility of microspheres are measured my using an apparatus is called micro electrophoresis. It is used to determine isoelectric point. The electrophoretic mobility can be related to surface contained charge, ion absorption nature of the microspheres.

7. **Capture Efficiency**:

It is determined by allowing the microsphere to loose and the lysate is synthesized for the determination of drug content as per mono graph. The per cent encapsulation efficiency is calculated using the following

Equation:

% Entrapment = Actual content / Theoretical content × 100

8. **Angle of Contact**:

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Wetting property of micro particulate matter can be determined by contact angle Φ measurement. It distinguishes the nature of microspheres in terms of hydrophilicity or hydrophobicity. The contact angle can measure at the solid/air/water interfaces.

9**. Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy**: The degradation of the polymeric matrix of the carrier system can be determined by using FTIR. Microspheres surface characteristics are investigated measuring alternated total reflectance (ATR). The ATR-FTIR gives information about the surface composition of the microspheres depending upon manufacturing Procedures and conditions.

10. Electron Spectroscopy for Chemical Analysis: The electron spectroscopy for chemical analysis (ESCA) used to determine the surface chemistry, atomic composition of surface degradation of biodegradable microspheres.

11. Percentage Yield: It is calculated as the weight of microspheres obtained from each batch divided by total weight of drug and polymer used to prepare that batch multiplied by 100.

12. In-vitro methods:

This method allows the determination of release characteristics and permeability of a drug through membrane. In-vitro method is employed as a quality control procedure in pharmaceutical production and in product development etc. Sensible and reproducible release data derived from physically, chemically and hydro dynamically defined conditions are necessary.

Beaker Method: In this method Dosage form is made to adhere at the bottom of beaker containing the medium and stirred uniformly using overhead stirrer. Volume of the medium used in the literature for the studies varies from 50-500ml and the stirrer speed from 60-300rpm.

13. Interface Diffusion Method: This method was developed by Dearden& Tomlinson. It consists of four compartments. Compartment A represents the oral cavity, and initially containing an appropriate concentration of drug in buffer. The compartment B is representing the buccal membrane, containing 1-octanol, and compartment C representing body fluids, containing 0.2M HCl. The compartment D represents protein binding, also containing 1-octanol. Before use, the aqueous phase and 1-octanol are saturated with each other. Samples are withdrawn and returned to compartment A with a syringe.

14. ModifiedKesharyChien Cell Method: It utilizes specialized laboratory designed apparatus. It comprises of a KesharyChien cell containing distilled water (50ml) at 37°C as dissolution medium. TMDDS (Trans Membrane Drug Delivery System) is placed in a glass tube fitted with a 10# sieve at the bottom which reciprocates in the medium at 30 strokes per minute.[33]

15. Dissolution Apparatus Method: Standard USP or BP dissolution apparatus have been used to study in-vitro release profiles using both rotating elements Paddle and basket. Dissolution medium used for the study varies from 100-500ml and speed of rotation from 50-100rpm.

16.In-vivo method: Method for studying the permeability of intact mucosa comprises of technique that gives the biological response of the organism locally or systemically and those that involve direct local measurement of uptake or accumulation of penetrate at their surface. The most widely used methods of in-vivo studies include using animal models, buccal absorption tests.

17. Animal Models: It is used mainly for the screening of series of compounds, investigating the mechanisms and evaluating a set of formulations. Animal model such as dogs, rats, pigs and sheep etc. are reported. Generally the procedure involves anesthetizing the animal followed by administration of dosage form, withdrawing blood at different time intervals and analysed.

18. Buccal Absorption test: It is most suitable and reliable method for measuring the amount of drug loss from human oral cavity for single and multi-component mixtures of drugs. The test has been successfully used to investigate the relative importance of drug structure, contact time, initial drug concentration and pH of solution while drug is held in oral cavity. The test is carried to measure the kinetics of the drug absorption by swirling a 25 ml sample of the test solution for 15 min by human volunteers followed by the expulsion of the solution. The amount of the drug remaining in the expelled volume is then determined to assess the amount of drug absorbed.

In-vitro/in-vivo correlation: Correlations between in-vitro dissolution rates and the rate and extent of availability as determined by blood concentration and or urinary excretion of drug or metabolites are referred to as “in-vitro-in-vivo correlation”. Such correlations allow one to develop product specifications with availability.

19. Swelling index: swelling index was estimated by measuring the extent of swelling of microspheres in the given buffer. To make sure the complete equilibrium, accurately weighed amount of microspheres were allowed to swell in given buffer. The excess surface adhered liquid drops were removed by blotting and the swollen microspheres were weighed by using microbalance. The hydrogel microspheres then dried in an oven at 60oc for 5 hr until there was no change in the dries mass of sample. The swelling index of microspheres was calculated by using the formula

Swelling index= (mass of swollen microsphere – mass of dry microsphere/ mass of dried microspheres) 100.[25]

Application of microspheres

Microspheres in Vaccine Delivery:

The role of microsphere is so pertinent particularly to deliver to vaccine directly to the target organism such as virus and bacteria etc.., The microsphere formulation is successfully used to deliver the vaccine eg. Hepatitis B vaccine and diphtheria vaccine etc. An ideal vaccine has to fulfil the requirement of safety, efficacy, route of administration and cost. Hence biodegradable polymers are used to develop the vaccine that can overcome the problem of conventional vaccine.

1. Biodegradable delivery system for vaccines is administered by parenteral route in order to overcome demerits of the conventional vaccines.

2. **Micro particulate Carriers in targeted delivery:**Micro particulatecarrier's acts as site specific drug delivery for showing therapeutic efficacy of the drug and specific interaction with the candidate receptor site. It can reduce the adverse effects and shows maximum efficacy and reproducibility.

3. Monoclonal Antibodies Mediated Microsphere: monoclonal antibodies are highly specific to that target. The microspheres are directly attached to monoclonal antibodies and used to target various cells or antigens. Monoclonal antibodies are extremely specific molecules and can be utilized by microsphere loaded drug molecules to selected site for maximum effect.

4. **Chemoembolization**: It is an endomucosal therapy with selective arterial embolization of the tumor mass with local delivery of chemotherapeutic agents. In this method the tumor mass is directly targeted by chemotherapeutic agents by vascular occlusion.

5. Organ imaging analysis: microspheres are recently investigated to imaging the vital organs particularly lungs. The particle size of the microspheres facilitates to imaging the organ. The microspheres are labeled with human serum albumin and used for scintiographic imaging of tumor mass in lungs.

Recent advances in microspheres:

Microspheres for biomedical applications:

Microspheres as fabricated from various biopolymers, bio active glasses and ceramics are an on-going challenge for many researches across the globe. A microsphere shows several advantages in biomedical applications over other particle geometrics.

Porous microspheres: porous microspheres exhibit greater surface area , lower mass density, superior cell attachment, cell proliferation, drug absorption, and drug release kinetics compared to bulk microspheres.

Glass based microspheres: Glass microspheres used in biomedical applications have been used for repair, restoration and regeneration of tissue within the body.

Ceramic based microspheres: ceramic microspheres specially employed in orthopaedics, dentistry and pharmaceutical sector such as calcium phosphate (CaP), Particularly hydroxyl apatite(HA) and β-tri calcium phosphate (β-TCP) due to their excellent biocompatibility , osteoconductivity and adequate mechanical properties.

Polymer based microspheres: polymer based microspheres are received considerable attention in recent years due to their potential control drug release characteristics either by leaching the bio active from polymer

or by degradation of polymer matrix. Selections of biodegradable polymer for the preparation of microspheres are very important for delivery of therapeutic agents. Most natural polymers such as proteins, chitosan, alginates deteriorate by enzymatic activity,whereas synthetic polymers such as poly lactic acid (PLA), poly caprolactides (PCL) , poly glycolic acid (PGA) and poly lactic-co- glycolic acid (PLGA) undergo hydrolytic degradation in the body.

CONCLUSION:

The current review article manifest thatMicrospheres are the best choice of drug delivery system than much other type of drug delivery systems. Development in the polymer science has made it possible to synthesise different biodegradable and non-biodegradable polymers which can be used for the preparation of microspheres with different characteristics by using different available techniques. Microspheres offer several improvements and advancements over existing technologies. The microsphere plays a significant role in novel drug delivery system particularly in disease targeted drug delivery. Due to the availability of novel biodegradable polymer, the microsphere formulation indeed is a versatile dosage form that can be used to treat various diseases.Microsphere has short term but it is having wide applications in drug delivery systems to get desired biological activity.

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