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Hollow Microsphere: A Review

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ABSTRACT

The main aim of this review article on hollow microspheres mainly to prove the gastric irritation on the stomach. The hollow microspheres are circular and they are one of the gastro retentive drug delivery systems mainly based on a non-effervescent approach. The following review states that the methods of preparation, requirements of gastric retention, advantages, limitations, list of drugs used in hollow microspheres are covered in this review article.

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1. INTRODUCTION:

The main aim of this drug delivery system is to provide a beneficial amount of drug to the proper ground in the body to achieve punctually and then maintain the desired drug consideration. The most appropriate often working path of drug delivery has faithfully been by oral ingestion. Hollow microspheres are mainly known as gastro retentive drug delivery systems. And shape consists of circular with a size of 200μm. Over the past three decades, there have been various advances in devices designed to retained in the upper part of the git tract consistently in terms of technology and diversity, encompassing, a variety of the systems and devices exemplified by floating drug delivery systems. There are raft forming, expanding systems, bioadhesive systems, and low-density systems[1].

2. REQUIREMENTS TO GASTRIC RETENTION:

To achieve this type of gastric retention the dosage form must satisfy certain requirements. One of these main issues the drug dosage form must be able to withstand the forces by peristaltic waves in their stomach walls and constant contractions and grinding mechanisms. They are different types of including a given below[2]:

A) HYDRODYNAMICALLY BALANCED SYSTEM:

Hydrodynamically balanced systems were first designed by Sheth and Tossounian in 1975. Such systems mainly include and contain drugs with gel-forming hydrocolloids only leads to stay in buoyant on the stomach. This type of system includes the incorporation of the long level of (20-75%) one or two gel-forming systems. They have cellulose, polysaccharides, matrix system include polycarbophil, polystyrene they are incorporated either in the tablets or capsules[2].

B) BIO/MUCOADHESIVE SYSTEMS:

This mainly where binds to the gastric epithelial cell wall surface or serves as mucin as a potential means of long waiting of GRT tract of a drug delivery system in the stomach, and by increasing the initiate and duration of contact of the drugs with biological membrane. The mucus layer in the stomach is based on self-guarding by mechanisms of the git tract. Mucus is made up of the viscoelastic gel-like forming composed of slime-like mainly of the glycoproteins. There is a thickness of mucus layer in slows down from the membrane surfacing area of the GI lumen. Bio adhesion (ab) is dependent on polymer concentration.

Bonding has two types

a) Physical / mechanical.

b) Chemical – 1. Primary/ covalent.

2. Secondary/ Ionic[3,4].

C) HIGH DENSITY SYSTEMS:

High density is another method of modification of gastro retentive drug delivery. The systems include a density of about 3 g/cm$^{3.}$ Are retained in the rugae of their stomach and are capable of withstanding peristaltic movements mainly acts as a threshold energy density after the systems can be retained lower part of the stomach. The big major formulations of the drug are very difficult to with a very high amount of high density of drugs (>50%) and it is mainly to achieve a density of about 2.8. the various diluents like barium sulfate (d= 4.9), zinc oxide, are easy to manufacture such as high-density formulations[5].

3. ADVANTAGES OF HOLLOW MICROSPHERES:

1. Easily a short half-life drug must be improved.

2. Gastric residence time is increased because of buoyancy.

3. Drug releases in a controlled manner for a prolonged period.

4. Site-specific drug delivery to the stomach can be proved.

5. Enhanced larges amount of absorption of drugs which solubilize only in the stomach.

4. METHODS OF PREPARATION:

The hollow microsphere are can be prepared by using any technique discussed in several techniques but the choice of the technique mainly depends upon the nature of the polymer used, the intended use, and the duration of the therapy. This mainly developed by preparation and its choice is equivocally determined by formulation and estimation of drugs are prepared. Generally, methods of preparation as follows:

A) SOLVENT EVAPORATION TECHNIQUE:

The polymers for growth of such system counting. Polymers are differing the drug solution and this differing is dissolved in a solution of ethanol, dimethyl ketone, or methylene chloride each other or merged to get a homogenous polymer solution. The solution has flowed into 100 mL of paraffin liquid at 1500 rpm. The emulsion is created and warmed up at 35^{o}C temperature for 3hr. After the creation of a stable emulsion, the dimethyl ketone or methylene chloride is completely evaporated, and arise solidified microspheres are filtered using Whatman filter paper[6,7].

B) EMULSION SOLVENT DIFFUSION METHOD:

The solution of polymer and drug in ethyl alcohol methylene chloride is flowed into an agitated aqueous solution of polyvinyl alcohol the ethyl alcohol fastly separation into the outer aqueous phase and the polymer precipitate around methylene chlorine droplets[8]. [9]The disappearance of the capture of methylene chloride leads to the creation of internal cavities within the microparticles. The drug is dissolved in Pharmaceutical Sciences in the organic solvent and the solution is distributed in the aqueous solvent producing the emulsion droplets even though the organic solvent is miscible. The major advantages of the emulsion solvent diffusion method include uniform and narrow size distribution of formed microspheres and the high efficiency of the process[9]. It has been shown in the flowchart[9].

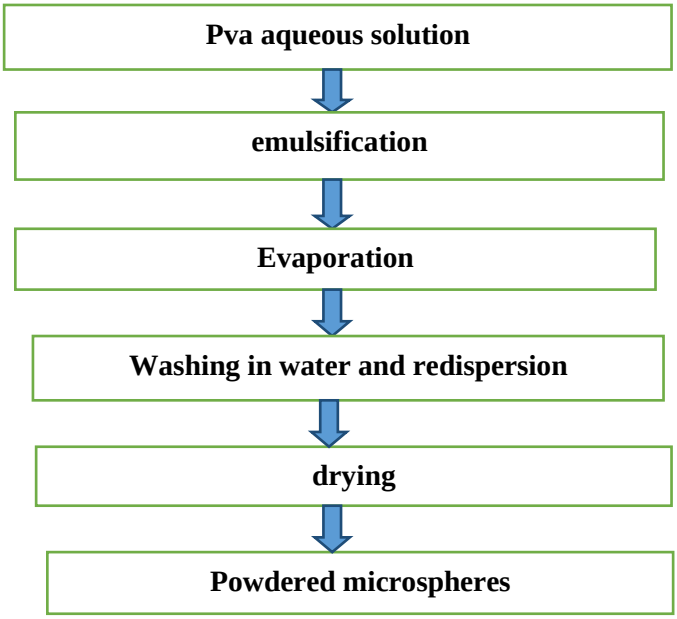

Figure No. 01: Emulsion Solvent Diffusion Method

C) SPRAY DRYING AND SPRAY CONGEALING:

These methods are based on the drying of the mist of the polymer and drug in the air. Hang on upon the removal of the solvent or the chill of the solution. The polymer is first dissolved in a suitable volatile organic solvent such as dichloromethane, acetone, etc. [11] The drug in solid form is dispersed in the polymer solution under high-speed homogenization. The separation of particles leads to the formation of small droplets or the fog from which the solvent evaporates immediately leading to the formation of the size of 1 – 100 μm. Microparticles are split from the hot air utilizing cyclone microspheres are divided while the traces of solvent are detached by vacuum drying[10,11].

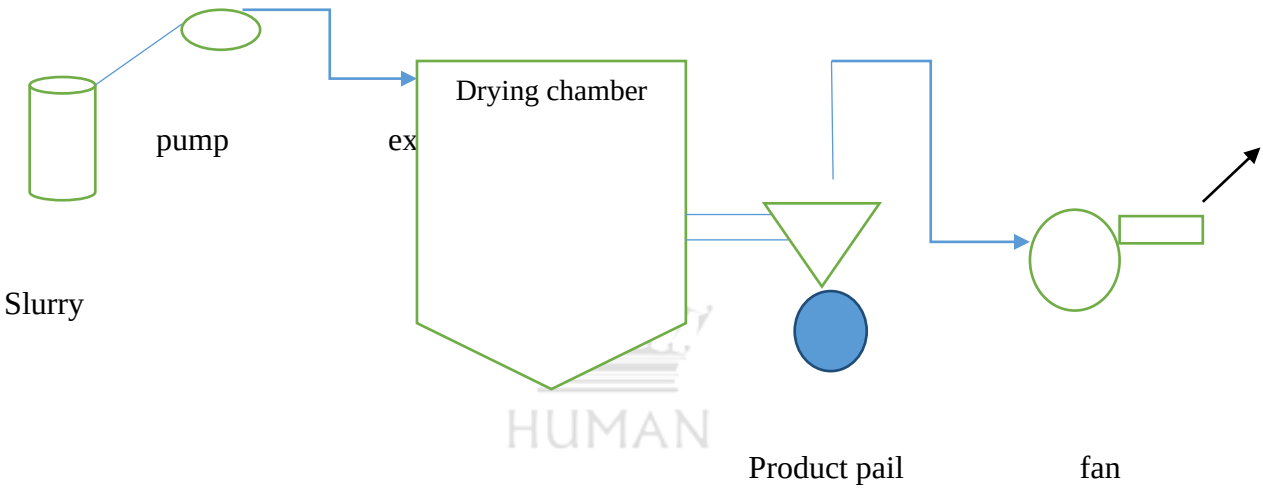

Fig No 02: Spray Drying Congealing Method

5. DRUGS SUITABLE FOR HOLLOW MICROSPHERES:

Table No. 1: Drugs suitable for Hollow Microsphere

Drugs	Preparation	Advantages
1.valacyclovir Hydrochloride[12]	Solvent evaporation method	Valacyclovir hydrochloride degrades intestinal fluid. The main aim where to floating microspheres of valacyclovir to localize the drug at the upper part of GIT, for improved absorption.
2. metformin hydrochloride[13]	Emulsion solvent diffusion method	Management for sufficient treatment of Diabetes to extend the gastric retention time oral sustained dosage form was developed in the form of microspheres using polymers.
3. Heparin[14]	SPRAY DRYING METHOD	Establish the feasibility of the spray drying for the preparation of microparticulate systems with an incorporated controlled-release mechanism to modify LMWH release.

6. EVALUATION OF HOLLOW MICROSPHERES:

Hollow microspheres are mainly processed by solvent evaporation method and emulsion solvent diffusion method to make around like inner hole. These hollow microspheres include many evaluations.

1.FLOATING SYSTEMS:

A) FLOATING TIME:

This can be well developed from the test for buoyancy is introduced from the simulated from the gastric and intestinal fluids from the maintained at 37'c. the time which can be determined from the united states pharmacopeia apparatus test from maintained at 900 ml of 0.1n HCL[3].

B) Specific gravity:

That the specific gravity mainly includes a gravity level of floating systems can be proved from the disintegrating method using benzene as a displacing medium.

C) Resultant weight:

The resultant weight of the move upwards to bottom, the bulk density mainly, and duration determined from the main source to establish the adequacy of dosage forming drugs[3].

$$F= F_{BUoy} - F_{GRAV}$$

$$F= (D_F – M/V)\ gV.$$

2. Bioadhesive strength:

Bioadhesive/ mucoadhesive systems:

This type of bioadhesive strength of a polymer will be determined by values of the measurement of the force required to spread the polymer's specimen sandwiched solution between the layers of an artificial or biological membrane. This can be well developed from the force measured by using either a modified precision balance or an automated texture analyzer.

3. SWELLING SYSTEMS:

a) Weight gain and water uptake:

The swelling systems mainly include a performance of dosage forms that can be checked from the water uptake. The dimensional change can be well determined from the measurement in terms of increase in the tablet diameter and measure the thickness of the water and time.

$$WU = (W_T - W_O) X100 / W_O$$

Where wt and wo are the weights of their dosage forms at time t and initially. GRDDS mainly shows the evaluation from the drug release and their performances[3].

4. Dissolution tests:

Dissolution tests mainly include a performed from the dissolution apparatus. Samples are done with dissolution Medium with replacement and performed from the analyzed from the drug contents after an appropriate dilution. They can be accomplished in the case of floating hollow by attaching a small, loose piece of non-reacting materials done. An alternative drug delivery system fully submerged the dosage formed under a sphere shape or mesh assembly. However, in the case of swellable systems and drugs released from the longly dependent on their fully surface exposure, unhindered swelling and the drug delivery solubility in they are water[3].

7. LIMITATIONS:

1.High rise of liquids in the stomach is required for the hollow microspheres to float and work accurately.

2. The drugs that go through first-pass metabolism (Procardia, inderal, etc.) are not suitable candidates.

3. Not satisfactory for drugs having solubility or stability problems in gastric fluids.

8. CONCLUSION:

Drug incorporation in the gastrointestinal tract is a largely different procedure and prolonging gastric retention of the dosage form extends the time for drug absorption. Hollow microsphere assurance to be a possible approach for gastric retention. they are the number of a hard time to be worked out to attain prolonged gastric retention, a large great of companies are focusing toward materialistic this technique.

9. REFERENCES:

1. S. B. Gholap*, S. K. Banarjee, D. D. Gaikwad, S. L. Jadhav, R. M. Thorat, An hollow microspheres, volume-1,issue-1 International journal of pharmaceutical review and research april 2010,pg no;74-79.
2. preethi k.suresh; Hollow microspheres as a drug carrier: An overview of fabrication and in vivo characterization techniques, chronicles of young scientists; published on january 2014.

3.n.k jain; gastro retentive drug delivery system;progress in controlled and novel drug delivery systems; chap-04 pg no: 76-95.
4. Samip Shah * and Shridhar Pandyaa; a novel in gastro retentive drug delivery system;international journal of pharmaceutical research;vol-1,issue-06, Received 12 March, 2010; received in revised form 28 April, 2010; accepted 17 May, 2010.
5. pranit.p.hajarae, and punit.rach; gastroretentive microballoons:an novel approach for drug delivery;international journal of pharmaceutical science and research;pubmon 12/06/2020.
6. M.s. kawade, ashwini; an review of microballoons:an advance technique for gastro retentive drug delivery system;International journal of pharmaceutical and clinical research;pgno: 84-89, published on 25 may 2019.
7. k.malleswari,d.rama brahma reddy,h.v.rajasekhar reddy; an microballoons; international journal of advanced research in science engineering and technology,vol.7,issue.1,published on jan2020.
8. Ankita srinivastava, ruchi shukla,kusum sharma,hitesh jain, microballoons:an gastro retentive drug delivery system; journal of drug delivery& therapeutics,pub on 2019; 9(4-s) pg no:625-630.
9. Kyekyoon kevin kim, daniel,w,pack; microspheres for drug delivery system;Biomems and biomedical nanotechnology;pg no: 19-50,published on 2006.
10. n.k.jain; microspheres in drug delivery systems; targeted and controlled drug delivery system;chapter-11; first edition, pg:421.
11. Rithesh kumar,surbhi kamboj,amrish chandra,vijay sharma:; microballoons an advance avenue for gastro retentive drug delivery system an review; u.k journal of pharmaceutical and biosciences; vol.4(4), pg no:29-40 ;published on 2016.
12. N.goswami,g.joshi,k.sawant; Floating microspheres of valacyclovir hcl in formulation and optimization,characterization invitro and invivo floatability studies;pub 2012.
13. Ghodake jd, vidhati,j.s. shinde da,kadam;Formulation and evaluation of floating microspheres of metformin hydrochloride(anti-diabetic);international journal of pharmaceutical technology and research pgno: 378-384,published on 2010.
14. N.Motekar ;optimization of experimental parameters for the production of lmwh-loaded polymeric microspheres;drug des devel ther,pub on 2009,77:419-41.