International Journal on Current Trends in Drug Development & Industrial Pharmacy
Vol 1, Issue 1 - 2017

RECENT TECHNOLOGICAL APPROACHES ON FLOATING DRUG DELIVERY SYSTEM

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ABSTRACT

Latest technological processes has been committed to the improvement of managed launch (CR) dosage forms transport structures to triumph over physiological troubles along with unpredictable gastric emptying times (GRT) and less gastric house instances (GRT). Floating drug delivery device are of specific attraction for deliver pills this is regionally active and have limited absorption window within the stomach and upper part of small gut, displaying low solubility at high pH and drug that is risky in the intestinal or colonic environment. Floating drug shipping systems (FDDS) are substances that go with the flow immediately upon touch with gastric fluids gift within the belly and by using floating drug shipping systems for reinforcing the bioavailability of medicine. The concept of gastric retention comes from the need to localize tablets at a selected target a part of gastrointestinal tract (GIT) which include the belly inside the body. The promising methods, methodologies and technique used within the improvement of FDDS by formulating both effervescent and non-effervescent floating tablets based totally on buoyancy mechanism. By using above suitable promising methods it is viable to supply tablets that have slender therapeutic window at specific area.

KEYWORDS: Gastric Residence Time, Bioavailability, Absorption Window, Swell Able Polymers.

INTRODUCTION

The gastric emptying of dosage forms is an variable method and ability to govern and lengthen the emptying time is a precious energy for dosage bureaucracy that reside in the stomach for an extended period of time in comparison to conventional dosage paperwork. There are extra problems confronted in getting ready of managed launch systems for enhanced absorption and expanded bioavailability (BA). One among such problems is the incapacity to enclose the dosage form within the target place of the gastrointestinal tract. Drug absorption from the gastrointestinal tract is a complicated manner and is subject to many variables. It's far widely acknowledged that the extent of gastrointestinal tract (GIT) drug absorption is related to contact time with the small intestinal mucosa.

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For that reason, small intestinal transit time is a vital parameter for drugs which can be partial absorbed. Basic human body structure with the details of motility styles, gastric emptying, physiological and formula variables affecting the cosmic emptying fee is summarized. Gastro retentive structures can remain in the gastric region for several hours and as a result remarkably extend the gastric residence time (GRT) of medicine. Prolonged gastric retention improves bioavailability, increase solubility for capsules which might be much less soluble in a high pH area and decreases drug waste. It has importance additionally for neighborhood drug transport to the stomach and proximal small intestines. Gastro retention allows offering higher accessibility of recent merchandise with new therapeutic prospect and sizable blessings for sufferers. Based on these standards, tactics and type of FDDS has been described in feature. Numerous latest examples had been mentioned displaying the effectiveness of such structures for tablets with bioavailability issues. [1, 2]

BASIC GASTROINTESTINAL TRACT PHYSIOLOGY

Anatomically the stomach is divided into 3 sections;

- Fundus
- Body
- Antrum (Pylorus)

Fundus and frame behave as a reservoir for undigested substances and antrum is the principle locality for mixing motions and acts as a pump for gastric emptying with the aid of transferring movements. Gastric emptying occurs in each the fasting and fed states. at some stage in the fasting state anterior digestive series of electrical vent take vicinity. Wherein cycle both via stomach and intestine every 2-three hrs is referred to as inter digestive migrating myoelectric cycle which is similarly divided into 4 levels. After the ingestion of a hybrid meal, the pattern of contractions changes from fasted to that of fed state which is also termed as digestive motility sample.

1. **Phase 1**-(Basic phase): last from 30-60 minutes with infrequent contractions.
2. **Phase 2**-(Pre burst phase): last for 20-40 minutes with irregular action potential and contractions.

As the phase progresses the intensity and frequency also increases moderately.

3. **Phase 3-(**Burst phase): last for 10-20 minutes which includes acute and regular contractions for short period also known as housekeeper wave.
4. **Phase 4:** last for 0-5 minutes and happens between phase 3 and phase 1 of 2 consecutive cycles. (Period of transition). [3] (Figure 1)

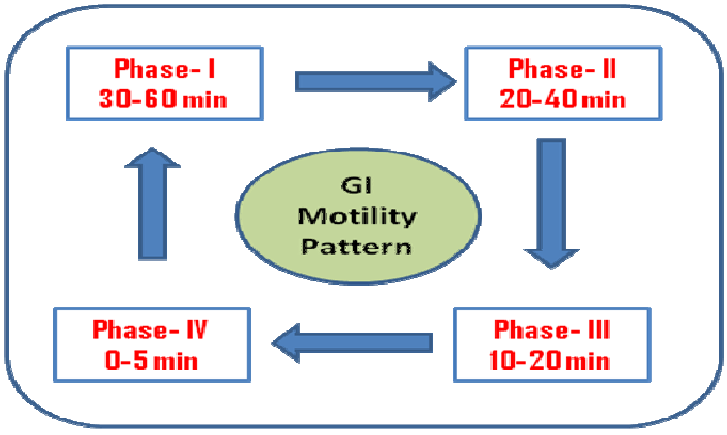

Figure 1.Gastrointestinal motility pattern

After the ingestion of a hybrid meal the pattern of contractions changes from fasted to that of fed kingdom is also called digestive motility sample and incorporates continuous contractions as in segment 2 of fasted country. These contractions bring about reducing the scale of meals debris (to much less than 1 mm), which are prompted towards the pylorus in a suspension shape (Figure 2). All through the fed country onset of MMC is retarded resulting in slowdown of gastric emptying charge. [4, 5]

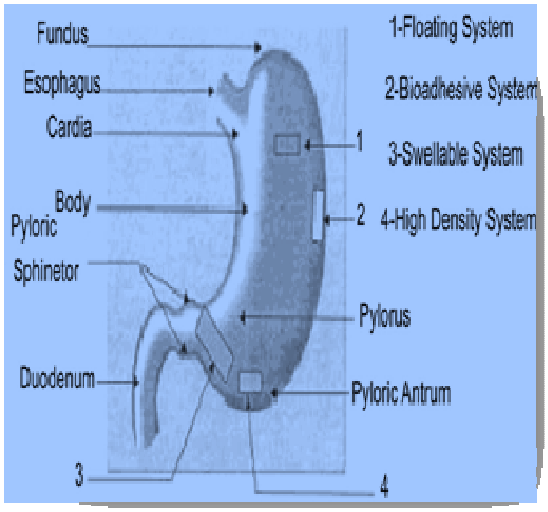

Figure 2.Physiology of gastrointestinal tract

CLASSIFICATION OF DRUG DELIVERY SYSTEM

A. Single Unit Floating Dosage Systems
   a. Effervescent Systems (Gas-generating Systems)
   b. Non-effervescent Systems

B. Multiple Unit Floating Dosage Systems
   a. Non-effervescent Systems
   b. Effervescent Systems (Gas-generating Systems)
   c. Hollow Microspheres

C. Raft Forming Systems

SINGLE UNIT FLOATING DOSAGE SYSTEMS

GAS-GENERATING SYSTEMS (EFFERVESCENT SYSTEMS)

Effervescent Systems are those buoyant systems hired matrices organized with swell capable polymers like HPMC, bubbling factors like sodium bicarbonate, polysaccharide like chitosan, citric acid and tartaric acid or chambers containing a liquid that gasifies at body temperature. The commonplace technique for getting ready these systems includes resin beads loaded with bicarbonate and covered with ethyl cellulose. The coating, that's insoluble however penetrable permit permeation of water. As a result, carbon dioxide is launched, causing the beads to go with the flow inside the belly. Excipients used in those systems consist of HPMC, agar, sodium alginate, calcium chloride, poly ethylene oxide, poly acrylate polymers, polyvinyl acetate and polycarbonates [6]

NON-EFFERVESCENT SYSTEMS

This type of gadget, after swallowing, through imbibitions of gastric fluid to a volume that it prevents their go out from the belly. One of the formula methods of such dosage forms entails the combination of drug with a gel, which swells in contact with gastric fluid after oral administration and continues a relative integrity of shape and a bulk density of much less than one within the outside gelatinous barrier. The air trapped by way of the swollen polymer confers buoyancy to that dosage bureaucracy. Examples of this form of FDDS encompass colloidal gel

barrier, micro porous compartment machine, alginate beads. Another type is a Fluid- filled floating chamber which includes incorporation of a gas-stuffed floatation chamber right into a micro porous component that homes a drug reservoir. [7, 8, 9]

MULTIPLE UNIT FLOATING SYSTEMS

In the vicinity of Hydrodynamic ally balanced system (gadget) (HBS) and different floating pills, those systems suffer from an crucial downside of excessive variability of gastrointestinal transit time, when orally administered, because of their all and not anything gastric emptying nature. in order to triumph over the above trouble, more than one unit floating structures were evolved, which lower the inter-challenge variability in absorption and lower the possibility of dose-dumping. Reports had been observed at the development of each non-bubbling and bubbling more than one unit structures. A good deal research has been focused and the scientists are still thinking about the field of hollow microspheres, able to floating at the gastric fluid and having upgraded gastric retention properties. [10]

NON-EFFERVESCENT SYSTEMS

Within the non-bubbling more than one unit structures a combination of drug, chitosan and acetic acid is extruded through a needle and the extrudate is reduce and dried. Chitosan hydrates floats inside the acidic media and the specified drug launch will be obtained through adjusting the drug-polymer ratio.

EFFERVESCENT SYSTEMS (GAS-GENERATING SYSTEMS)

According to the reports of sustained release floating granules containing tetracycline hydrochloride, the granules are mixture of drug granulates of two degrees A and B. level A contains 60 parts of HPMC, forty components of polyacrylic acid and 20 elements of drug and stage B consists of 70 components of sodium bicarbonate and 30 elements of tartaric acid. 60 elements via weight of granules of degree A and 30 parts through weight of granules of stage B are mixed with a lubricant and filled into capsule. In dissolution media, the capsule shell dissolves and liberates the granules, which showed a floating time of extra than eight h and sustained drug launch of 80% in approximately 6.5 h. Alginates have received tons attention inside the development of multiple unit structures. Alginates are non-poisonous, biodegradable linear copolymers product of L-glucuronic and L-mannuronic acid residues. A more than one unit device turned into prepared accommodates of calcium alginate middle and calcium alginate or PVP membrane, each separated via air compartment. In presence of water, the PVA leaches out and increases the membrane permeability, preserving the integrity of the air compartment. Increase in molecular weight and attention of polyvinyl alcohol, resulted in enhancement of the floating houses of the machine.

Freeze-drying technique is also used for the guidance of floating calcium alginate beads. Sodium alginate answer is introduced drop wise into the calcium chloride aqueous solution, inflicting the instant gelation of the droplet floor, because of formation of calcium alginate. The received beads are freeze dried following a porous structure, which resource in floating. The authors studied the behaviour of radio categorized floating beads and compared with non-floating beads in guy volunteers using gamma scintigraphy. Prolonged gastric residence time of more than 5 h is determined for floating beads.

The hollow microspheres are taken into consideration as one of the very promising buoyant systems, as they possess precise advantages of a couple of unit structures in addition to better floating homes, because of valuable hole area in the microsphere. The

overall strategies concerned in the guidance are simple solvent evaporation and solvent diffusion and evaporation. The drug launch and improved floating homes depend on the type of plasticizer, polymer and the solvents used for the instruction. Polymers consisting of polycarbonate, Eudragit® Sand cellulose acetate have been used in the preparation of hole microspheres and the drug launch may be changed by using optimizing the polymer amount and the polymer-plasticizer ratio. Sustained launch floating microspheres the usage of polycarbonate had been evolved employing solvent evaporation method. Aspirin and griseofulvin had been used as version drugs. Dispersed section containing polycarbonate answer in dichloromethane and micronized drug changed into introduced to the dispersion media containing sodium chloride, polyvinyl alcohol and methanol. The dispersion has been stirred for 3-4h to guarantee the whole solvent evaporation and the microspheres received were filtered and washed with bloodless water and dried. The spherical and hollow nature of the microspheres changed into confirmed by means of Scanning electron microscopic research. The microspheres confirmed a drug payload of greater than 50% and the quantity of drug included is discovered to be affecting the particle length distribution and drug launch. [13]

RAFT FORMING SYSTEMS

Raft forming systems received much interest for the shipping of antacids and drug delivery for gastrointestinal infections and disorders. The basic mechanism involved inside the raft formation includes the formation of viscous cohesive gel with gastric fluids, in which in each portion of the liquid swells forming a continuous layer known as a raft (Figure 3). The raft floats due to the buoyancy created by means of the formation of CO_2 within the gadget and act as a barrier to stop the reflux of gastric contents like HCl and enzymes into the esophagus. Normally the machine consists of a gel forming agent and bicarbonates or carbonates chargeable for the formation of CO_2 and makes the device much less dense and flow on the gastric fluids. [14]

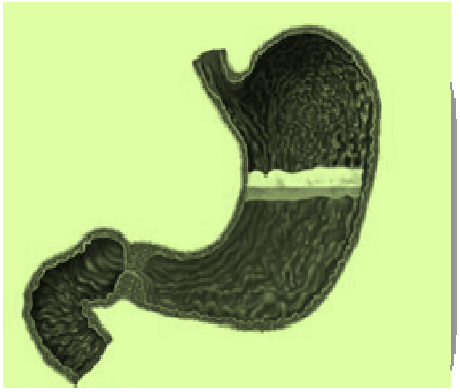

Figure 3.Raft forming systems

MECHANISM OF FLOATING SYSTEMS

Floating drug shipping systems (FDDS) having bulk density less than gastric fluids and continue to be buoyant in the belly without affecting the gastric emptying price for a extended time frame. While the gadget is floating at the gastric contents (figure 4) the drug is released slowly on the desired fee from the machine. After release of drug the residual device is emptied from the stomach. This consequence is a multiplied GRT and a higher manipulate at the fluctuations in plasma drug awareness. However, except a minimum gastric content material needed to allow the desired achievement of the buoyancy retention precept a minimum degree of floating pressure (F) is likewise required to maintain the dosage shape reliably buoyant on the surface of

the meal. To degree the floating force kinetics novel equipment for resolving of resultant weight has been stated in the literature. The equipment operates by measuring constantly the pressure equal to F and is required to preserve the submerged object. The item floats better if F is on higher fantastic aspect. This equipment enables in optimizing FDDS with recognize to durability and balance of floating forces produced with a purpose to save you the drawbacks of unforeseeable intra-gastric buoyancy capability variations [15, 16].

$$F = F_{buoyancy} - F_{gravity} = (Df - Ds)\, gV$$

Wherein, F= total vertical pressure, Ds = item density, Df = fluid density, g = acceleration because of gravity and V = extent

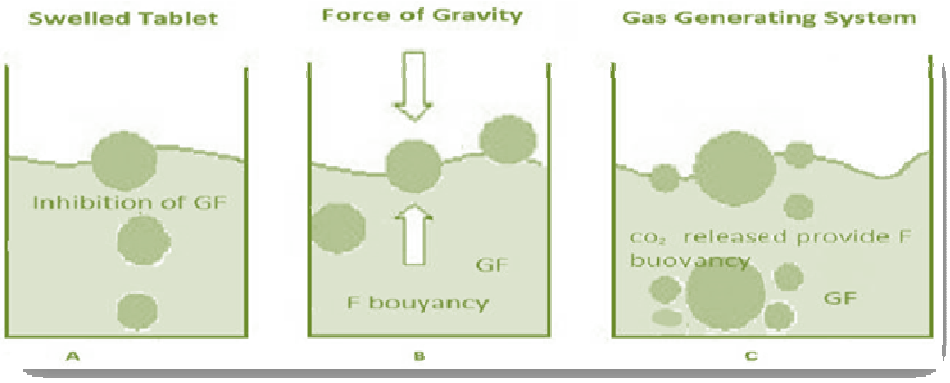

Figure 4.Different mechanisms of floating systems

ADVANTAGES OF FDDS

1. The FDDS structures are high-quality for tablets absorbed via the belly e.g. ferrous salts, antacids.
2. Acidic substances like aspirin motive infection on the stomach wall surface while are available in contact with it. HBS components may be beneficial for the management of aspirin and other comparable pills.
3. Greater absorption of drugs which solubilize handiest in stomach.
4. The gastro retentive structures are superb for pills suggest for local action in the belly. E.g. Antacids.
5. Bioavailability enhances notwithstanding first skip impact due to the fact fluctuations in plasma drug awareness are averted, a practical plasma drug attention is maintained by continuous drug launch.
6. FDDS improves affected person compliance by way of decreasing dosing frequency.
7. When there is a vigorous intestinal movement and a quick transit time as may arise in positive type of diarrhea, negative absorption is anticipated. beneath such situations it is able to be effective to keep the drug in floating situation in stomach to get a exceedingly better response
8. Better therapeutic impact of quick half of-lifestyles tablets may be finished.
9. Gastric retention time is improved because of buoyancy.
10. Administration of prolongs release floating dosage bureaucracy along with pill and drugs will bring about dissolution of the drug in the gastric fluid. They dissolve inside the gastric fluid and could be to be had for absorption within the small gut after emptying of the belly contents. It is consequently predicted that a drug could be absolutely absorbed from floating device if it remains in the answer form even at the alkaline pH of the gut. [17, 18]

DISADVANTAGES OF FDDS

1. The major drawback of floating system is necessity of sufficient high degree of fluids in

the belly for the drug shipping to waft. But this limitation can be triumph over by way of coating the dosage form with the resource of bio-adhesive polymers that easily adhere to the mucosal lining of the stomach. [19]

2. Gastric retention is influenced by means of many elements which include gastric motility, pH and the presence of food. These factors are in no way steady and therefore the buoyancy can't be predicted.
3. Drugs that reason inflammation and lesion to gastric mucosa aren't appropriate to be formulated as floating drug delivery systems.
4. High variability in gastric emptying time because of its all (or) non-emptying system.
5. Sufferers have to no longer be dosed with floating paperwork simply before going to bed.
6. Floating machine isn't always viable for the ones drugs which have solubility (or) stability problem in gastric fluids.
7. The dosage form has to be administered with at the least glass complete of water (200-250 ml).

DRUG CANDIDATES SUITABLE FOR FDDS

Numerous capsules have greater therapeutic effect whilst released within the belly, specifically whilst the discharge is prolonged in a non-stop controlled way. In general appropriate applicants for FDDS are molecules which have less colonic absorption however are characterized by means of more desirable absorption houses on the top parts of the GIT. [20, 21, 22]

1. Tablets that have slender absorption window in GIT (L-DOPA, p-aminobenzoic acid, furosemide, riboflavin).
2. Tablets those are locally energetic in the stomach (e.g. misroprostol, antacids).
3. Pills those are unstable inside the intestinal or colonic environment. (captopril, ranitidine HCl, metronidazole).
4. Drugs that disturb normal colonic microbes (e.g. antibiotics used for the eradication of Helicobacter pylori which include tetracycline, amoxicillin).
5. Drugs that show off low solubility at excessive pH values (e.g. diazepam, chlordiazepoxide, verapamil).

METHODS FOR PREPARING FLOATING DOSAGE FORM

Following techniques can be used for making ready floating dosage forms [23, 24, 25]

1. Using gel-forming hydrocolloids together with hydrophilic gums, gelatin, alginates, and cellulose derivatives and so on.
2. The use of low-density enteric substances such as cellulose acetate phthalate and meth acrylic polymer.
3. With the aid of decreasing particle size and filling it in a tablet.
4. By way of forming carbon dioxide fuel and next entrapment of it within the gel network.
5. By getting ready hole micro-balloons of drug the use of acrylic polymer and filled in capsules.
6. Through incorporation of inflatable chamber which comprise a liquid e.g. solvent that gasifies at frame temperature to cause the chambers to inflate within the stomach.

FACTORS AFFECTING FLOATING DRUG DELIVERY SYSTEM

The gastric retention time of dosage paperwork is managed by means of various elements which includes density and size of the dosage shape, food intake, nature of the meals, posture, age, intercourse, sleep and illness of person (gastrointestinal illnesses and diabetes) and administration of medication including prokinetic marketers (cisapride and metoclopramide).

DENSITY OF DOSAGE FORM

Dosage form having a density decrease than that of gastric fluid experience floating behavior and therefore gastric retention. A density of <1.0

gm/cm3 is needed to exhibit floating property. However the floating tendency of the dosage shape decreases as a characteristic of time as the dosage shape receives immersed into the fluid, due to the improvement of hydrodynamic equilibrium. [26]

SIZE OF DOSAGE FORM

The dimensions of the dosage shape are any other component that affects gastric retention. The mean gastric residence times of non-floating dosage bureaucracy are greater variable and depending on their length which can be small, medium and large devices. In most cases the bigger the scale of the dosage form, the more might be the gastric retention time due to the fact the larger size wouldn't allow the dosage form to bypass through the pyloric antrum into intestine. Hence, the scale of the dosage form appears to be an essential factor affecting gastric retention. [27]

FOOD CONSUMPTION AND NATURE OF FOOD

Food intakes, character of the meals, caloric content material and amount of feeding have a profound effect at the gastric retention of dosage forms. The presence or absence of meals in the belly influences the GRT of the dosage form. Commonly, the presence of meals will increase the gastro retention time of the dosage form and increases drug absorption by permitting it to live at the absorption web site for an extended time. [28]

IMPACT OF GENDER, POSTURE AND AGE

A look at determined that women confirmed relatively shorter imply ambulatory gastro retention time than males and the gastric emptying charge in girls become slower than in men. The authors additionally studied the effect of posture on gastro retention time and determined no widespread difference inside the suggest gastro retention time for people in upright, supine nation and ambulatory. However in a comparative observe in human beings, the floating and non-floating systems behaved in another way. In the upright position, the floating structures floated on the top of the gastric contents and remained for a longer time, displaying extended gastro retention time. However the non-floating gadgets settled to the decrease a part of the stomach and underwent quicker emptying price because of peristaltic contractions and the floating gadgets remained far from the pylorus. But, in supine function, the floating gadgets are emptied quicker than non-floating units of comparable size**.** [29, 30, 31]

ASSESSMENT OF FLOATING DRUG DELIVERY SYSTEMS

DETERMINATION OF HARDNESS OF TABLET

Randomly selected twenty drugs in every batch of formulations have to be used for the determination of hardness with the assist of Monsanto hardness tester.

DETERMINATION OF WEIGHT VARIATION

Twenty tablets selected at randomly are weighed appropriately and the common weight of the tablet is calculated. Then the deviation of man or woman weight from the common weight is calculated.

Table No 1.Weight variation Limits

IP/BP	Limit	USP
80 mg or less	± 10%	130mg or less
More than 80mg or Less than 250m	± 7.5%	130mg to 324mg
250mg or more	± 5%	More than 324mg

DETERMINATION OF THICKNESS OF THE TABLET

The person crown to crown thickness of ten tablets is determined the use of slide calipers for every batch. [32]

MEASUREMENT OF FLOATING CAPACITY

Three individual drugs are put in character flask containing 400ml of 0.1(N) HCL solutions. Then the time in mins for every tablet to go from the bottom to the top of the flask (floating lag time) and the time for which pills drift at the surface (duration of floating) are measured. The sample implies and widespread deviation is then calculated. [33]

ANGLE OF REPOSE

Attitude of repose is determined by the usage of funnel method; the correctly weighed spheres are taken in funnel. the height of funnel is adjusted in one of these manner that the end of funnel simply touches the apex of heap of blends. The blends are then allowed to waft thru funnel freely on to surface. The diameter of powder cone changed into measured; perspective of repose is calculated through the usage of following equation. [34]

Tan θ = h/r

Where, h=height of pile, θ =angle of repose, r=radius of base

Table No. 2 Angle of Repose

Flow properties	Repose angle(^{o})
Excellent	25-30
Good	31-35
Fair	36-40
Passable	41-45
Poor	46-55
Very poor	56-65
Very Very poor	More than 66

MEASUREMENT OF THE DENSITY OF THE FORMULATION

The obvious densities of the tablets are calculated from their volumes and loads. The extent of the cylindrical tablets are calculated from their peak h and radius r (each decided with a micrometer gauge) the usage of the mathematical equation for a cylinder ($V = A \times r^2 \times h$). [35]

DETERMINATION OF DRUG CONTENT IN TABLETS

3 tablets from each batch are selected randomly and transferred to a 100ml volumetric flask stuffed up to 100ml with 0.1 (N) HCL. Stored it for forty eight hours then taken 1ml from each of volumetric flask and transferred to the check tubes. Samples are then filtered, certainly diluted and analyzed by way of spectro-photometrically at a appropriate wavelength.

IN-VITRO DISSOLUTION STUDY

The tablet became placed within the dissolution vessel. 5ml of pattern have been withdrawn at one-of-a-kind time intervals. The quantity of dissolution fluid adjusted to 900 ml by means of changing sparkling 5ml of dissolution medium after every sampling. The discharge studies had been performed with 3 drugs, and the suggest values had been plotted as opposed to time. Every pattern becomes analyzed at maximum wavelength the usage of double beam UV visible spectrophotometer towards reagent clean. [36]

APPLICATIONS OF FLOATING DRUG DELIVERY SYSTEMS

ENHANCE BIOAVAILABILITY

The bioavailability of CR-GRDF is appreciably stronger in evaluation to the management of non-GRDF CR polymeric formulations. There are numerous specific tactics, related to absorption and transit of the drug in the GIT that act concomitantly to steer the significance of drug absorption.

SUSTAINED DRUG DELIVERY

In this structures dose massive in size and passing from the pyloric commencing is prohibited. New sustained launch floating capsules of Nicardipine hydrochloride have been advanced and were evaluated in vivo. Plasma concentration time curves confirmed an extended time period for management (16 hours) inside the sustained launch floating capsules as compared with conventional MICARD tablets (8 hours).

Similarly a comparative observe among the Madopar HBS and Madopar standard formula changed into executed it shown the drug changed into released up to 8 hours in vitro within the former case and the release finished in less than half-hour inside the latter case. [36, 37]

SITE SPECIFIC DRUG DELIVERY SYSTEMS

Those systems are mainly fantastic for drugs those are specifically absorbed from the belly or the proximal part of the small gut. The controlled gradual delivery of drug to the belly provides higher neighborhood therapeutic tiers and boundaries the systemic publicity to the drug. It reduces the aspect outcomes which because of the drug inside the blood flow. The prolonged gastric availability from a website directed shipping device may lessen the dosing frequency. [36, 37]

ABSORPTION ENHANCEMENT

Drugs which having poor bioavailability because of web site particular absorption from the upper a part of the GIT are ability candidates to be formulated as floating drug transport systems, there via maximizing their absorption. E.g. A substantially increase inside the bioavailability of floating dosage paperwork (42.9%) may be executed in comparison with commercially to be had LASIX drugs (33.4%) and enteric lined LASIX-lengthy product (29.5%)

REDUCE FLUCTUATIONS OF DRUG CONCENTRATION

Non-stop enter of the drug following controlled launch gastro-retentive dosage shape management produces blood drug concentrations inside a slender variety as compared to the instantaneous launch dosage forms. Accordingly, fluctuations in drug effects are minimized and the attention structured unfavorable consequences which are associated with height concentration profile may be avoided. This selection is of unique significance for capsules with a slender healing index.

LIST OF DRUGS EXPLORED FOR VARIOUS FLOATING DOSAGE FORMS

1. **Microspheres Tablets/Pills:** Aspirin, griseofulvin, Acetaminophen, p-nitroaniline, Acetylsalicylic acid, Ibuprofen, Terfenadine, Ampicillin, Trani-last, Atenolol, Theophylline, Captopril, Sotalol.
2. **Films:** Pireta-nide, Prednisolone, Quinidine gluconate, P-Aminobenzoic acid, Cinnarizine.
3. **Granules:** Cinnarizine, Diclofenac sodium, Diltia-zem, Indomethacin, Fluorouracil.
4. **Powders:** Riboflavin,phosphate, Sotalol, Theophyl-line.
5. **Capsules:** Verapamil HCl, Chlordiazepoxide HCl, Diazepam, Furosemide, L-,opa and benserazide Misoprostol, Propranolol HCl.

Table No. 3 Marketed products of FDDS

Sr. No.	PRODUCT	Active Ingredient
1.	Madopar	Levodopa & Benserzide
2.	Valrelease	Diazepam
3.	Topalkan	Aluminium Magnesium Antacid
4.	Almagate	Flatcoat Antacid
5.	Liquid gavi-son	Alginic acid & Sodium bicarbonate

CONCLUSION

Growing an efficient FDDS is a actual undertaking and the drug shipping system broaden FDDS has emerged as one of the maximum promising gastro-retentive drug transport machine. The FDDS has a bonus for pills which are absorbed on the whole in the higher part of the GIT, the stomach, duodenum, and jejunum. Currently many drugs were formulated as floating drug shipping structures with a aim of sustained release and restricting the place of drug release to belly. The principle of buoyant education gives a easy and realistic approach to reap superior gastric house time for the dosage shape and sustained drug release from the dosage shape. The most important criteria which have to be looked into for the production of a FDDS are that the density of the dosage form should be less than that of gastric fluid and it can be concluded that these dosage paperwork serve the satisfactory inside the treatment of illnesses related to the GIT and for achieving a prolonged action from a drug with a brief 1/2 existence.

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