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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Floating Drug Delivery Systems: A Review

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ABSTRACT

In recent years, especially in the last two decades, there has been a great deal of technical and scientific research into the development of standardized drug administration programs to overcome physical ailments, such as short-term pregnancy (GRT) and unexplained abortion periods (GET), so that you can develop forms. of abdominal tightness, which will allow the delivery of banned 'window-sucking' drugs into a specific section of the GI tract. Many methods are currently used to extend GRT, including floating drug delivery systems (FDDS), also known as hydrodynamically balance systems (HBS), inflammatory and enlargement systems, very large systems, and other digestive devices. In this review, we discuss the current and recent developments of FDDS, including patented delivery systems and products on the market.

Keyworsd: FDDS, Gastric emptying, Gastro-retentive. Etc.

Introduction

The purpose of the drug delivery program is to pay for the amount of drug treatment in the appropriate place in the body so that it can be quickly detected and the desired drug concentration maintained. The oral route is increasingly being used for the delivery of therapeutic drugs because the lower the cost of treatment and easier treatment leads to higher levels of patient compliance.[1]

Abortion of dosage forms is an extremely flexible process and the ability to extend and control time is an important asset of the dosage forms, which remain in the stomach longer than standard dosage forms. programs for better absorption and improved access to better performance. One such difficulty is the inability to block the measuring form in the desired area of the intestinal tract. Absorption of drugs from the intestinal tract is a complex process and is subject to many variations. It is widely known that the amount of absorption of drugs in the intestinal tract is related to the time of contact with the small intestinal mucosa. Therefore, short-term bowel movement is an important parameter of fully utilized drugs. Basic physical activity details of abortions, motility patterns, and variations in body function and composition that affect cosmic emissions are summarized.[1]

things like the availability of food. Drugs with a short life span are quickly removed from the bloodstream. There are various oral delivery systems in place that can overcome these problems and release the drug to maintain its plasma capacity for a long time. This has led to the formation of oral scale forms used in the oral cavity. Gastrointestinal preservation is essential for oral medications, drugs that do not dissolve or are damaged by high intestinal pH, and absorption drugs that can be altered by altering the digestive tract. Contraceptive dosage forms are also useful for local and ongoing drug delivery in certain cases, such as H infection. Pylori which is the cause of birth defects. This dosage form improves the availability of efficacy, therapeutic efficacy and may also allow for possible dose reduction due to stable treatment levels, for example furosemide and ofloxacin. -lactam antibiotic (penicillins and cephalosporins).[3]

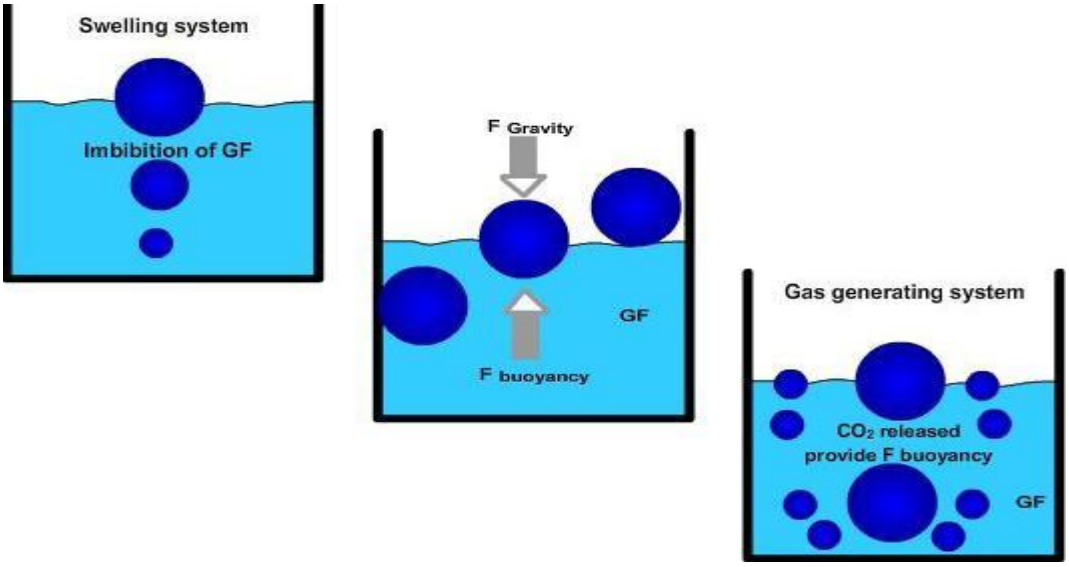
Mechanism of Floating Drug Delivery Systems

Floating systems are low density systems that are strong enough to float over the contents of the stomach and remain in the stomach for a long time. While the system floats over the contents of the stomach, the drug is released slowly at the desired rate, which leads to increased pregnancy retention time and reduced flexibility. However, in addition to the minimal content of the stomach required to allow for the proper achievement of the energy conservation goal, a small amount of float energy (F) is also required to keep the dose form reliable in the Surface diet. To measure the kinetics of floating power, novel instruments for determining the output weight have been reported in the literature. The device operates by continuously measuring the F-strength (as a time function) required to store the inserted object. The object floats better when F is on the positive side as shown in figs. These resources help to expand the FDDS in relation to the resilience and resilience of the floating forces produced to prevent the effects of unparalleled inequalities.[2]

F = F buoyancy – F gravity = (DF – Ds) gv.

Where, F= total vertical force,

DF = fluid density,
Ds= object density, v = volume and
g = acceleration due to gravity



Drug Candidates Suitable for FDDS

1. Drugs with a small absorption window in the GI tract (e.g. L-DOPA, paminobenzoic acid, furosemide, riboflavin).

2. Drugs that have a local effect in the stomach (e.g. misroprostol, antacids).

3. Drugs that are unstable in a colonic or intestinal environment (e.g. captopril, ranitidine HCl, metronidazole).

4. Antibiotics used to treat Helicobacter pylori, such as tetracycline, clarithromycin, and amoxicillin, may disrupt natural colonic microorganisms.

5. Drugs with a high pH value but low solubility (e.g. diazepam, chlordiazepoxide, verapamil).

Classification of Floating Drug Delivery Systems (FDDS)

(A) Effervescent FDDS

(I) Gas generating system

(II) volatile liquid containing system

(B) Non- Effervescent FDDS

(I) Colloidal gel barrier system

(II) Microporous compartment system

(III) Floating microsphere

(IV) Alginate floating beads.

(C) Raft forming system

(A) Effervescent System FDDS

These are the matrix type types.. A flammable polymer such as methylcellulose or Chitosan, as well as different effervescent chemicals, are used to make it.
Sodium bicarbonate, tartaric acid, and citric acid are examples.
When they come into touch with the contents of the stomach, the co2 is released and retained in the enlarged hydrocolloid, providing maturity in the form of digestion. The distribution technique was created to address the issue of three-layer uneven tablets causing inflammation. [5]

(I) Gas Generating Systems

These are very small FDDS based on co2 formation within the device after contact with body fluids. The material is made so that when it reaches the stomach, the co2is is released by the acid content of the stomach and is trapped in the illuminated hydrocolloid this produces a high degree of movement of the measuring form and maintains its eruption. Reduce the gravitational force that causes the dosage form to float in the chyme. Co2-producing elements can mix closely within the tablet matrix in which a single layer or bilayered gas containing one hydrocolloid containing a layer and a drug in another layer is formed the result of a continuous release.[5]

(II)Volatile Liquid Containing Systems (Osmotically Controlled DDS)

Like the Osmotically controlled float system, the device was a crippled hallow unit that was converted from a collapsed area after a long time. The house was attached to this crippled unit and was divided into a first and second room with rooms separated by an invincible moving unit. The first chamber contains an active substance, while the second chamber contains volatile liquids, such as cyclopentane or ether, which stimulate body temperature to produce gas, enabling the drug dam to float. To enable the unit to escape from the abdomen, the device contained a plug that was not allowed to be ventilated.[5]

(B) Non-Effervescent FDDS

Non-Effervescent FDDS uses a type of gel that builds up or swells the hydrocolloids, Polysaccharide, a matrix that forms a polymer such as polycarbonate, polymethacrylate and polystyrene. One of the construction methods involves mixing the drug with the gel forming hydrocolloids in contact with the gastric juice after oral administration and maintaining the integrity of the stand and the barrier of bulk, the air trapped by the swollen polymer gives strength to the scale forms.[5]

(I) Colloidal Gel Barrier Systems (Hydrodynamic Balanced Systems)

Such a system contains hydrocolloid-containing drugs that form a gel intended to remain soft on the contents of the stomach. This increases GRT and increases the amount of the drug reaching its absorption in the form of a solution in order to absorb it, a process that involves a high level of one or more gel forming a highly hydrocolloid cellulose type.
e.g. (HPMC), polysaccharides and matrix form polymers such as polycarbophil, polystyrene and polyacrylate. When in contact with GI fluid, the hydrocolloid in the system absorbs and forms a colloid gel barrier worldwide.[5]

(II) Microporous Compartment Systems

This technology is based on the integration of a drug dam into a Microporous chamber with pores in its upper and lower walls. The boundary wall of the drug storage room is completely closed to prevent any direct contact with the abdomen and the drug that can be eliminated. In the abdomen, a floating chamber containing compressed air causes the air chamber containing the compressed air to cause the delivery system to float above the contents of the stomach. The gastric fluid enters through the opening, dissolving the gastric fluid to the point that it prevents its presence in the drug and the carrier of the dissolved drug carries continuous transport to all the intestines.[5]

(III)Floating Microspheres / Micro balloons

Hallow microspheres are considered to be the most promising system as they are the most useful due to the internal hallow space within the microsphere. The Hallow microsphere loaded with medicine on their outer polymer shelf was prepared for the novel method of emulsion solvent Diffusion.[5]

(IV) Alginate Beads / Floating Beads

Floating dosage forms for many units have been developed from calcium alginate capture. Round beads approximately 2.5 mm in diameter can be prepared by dissolving the sodium alginate solution in a strong solution of calcium chloride. It causes a rain of calcium alginate. The beads are more fragmented, freezing the liquid in liquid nitrogen and freezing at 400C for 24 hours, leading to the formation of a perforated system, which can keep the energy floating for more than 12 hours. these floating beads provide a lifespan of more than 5.5 h.[5]

(C) Raft forming systems

The Raft development program has received a lot of attention in antacid delivery and drugs Delivery of gastrointestinal infections and gastrointestinal fluid contact gel that causes Solution to swell and form a cohesive gel containing co2 bubbles. Which builds up a layer of mucus on top of the gastric mucosa that drains the medicine slowly from the stomach. (Usually used for the treatment of gastro esophageal reflux.[5]

Factors affecting Floating Drug Delivery System:[6]

A) Density: The dosage form's density should be smaller than the contents of the stomach (1.004gm/ml).

B) Size and Shape: Dosage form units with a diameter of more than 7.5 mm had a higher GRT than those with a diameter of 9.9 mm, according to studies. When compared to other shapes, the dosage form with a shape tetrahedron and ring shape devises with a flexural modulus of 48 and 22.5 kilo-pond per square inch (KSI) have greater GIT retention for 90 to 100 percent retention at 24 hours.

C) Fed or Unfed State: GI motility is characterised by times of intense motor activity, also known as migrating myoelectric complexes (MMC), which occur every 1.5 to 2 hours when fasting. The MMC removes undigested material from the stomach, so if the formulation is given at the same time as the MMC, the unit's GRT should be quite brief. MMC is delayed in the fed condition, and GRT is significantly longer.

D) Meal Nature: Feeding indigestible polymers of fatty acid salts to the stomach might cause the motility pattern of the stomach to transition to a fed state, slowing gastric emptying and prolonging medication release.

E) Caloric Content: A high-protein meal can boost GRT by 4 to 10 hours.

Evaluation Parameters [7]

1. Particle Size and Shape Evaluation: Particle size and shape play a big influence in influencing the drug's melting potential and hence its discovery potential. Sieve analysis, Air elutriation analysis, Photo analysis, Optical microscope, Electro (Coulter counter) calculations, Sedimentation techniques, Laser diffraction methods, Ultrasonic attenuation spectroscopy, Air Pollution Rates, and other methods were used to estimate particle size.

2. Floating Properties: Using a continuous floating monitoring system and a statistical experimental methodology, the effect of formulation variables on the floating properties of a gastric floating medication delivery system was studied.

Surface topography and structures were determined using a scanning electron microscope with a 10k.v acceleration voltage, a contact angle metre, Atomic Force Microscopy (AFM), and a contact profilio-meter.

4. Swelling Tests: To calculate the biological characteristics of swelled polymers, inflammatory studies were conducted. Dissolution tools, visual microscopy, and other techniques such as 1HNMR imaging, Confocal laser scanning micro- and fats scopy (CLSM), Cryogenic Scanning Electron Microscopy (Cryo-SEM), Light scattering imaging (LSI), and others were used to determine inflammation. The following approach is used to calculate inflammation studies using the Dissolution equipment (USP elimination tools).
Weight of wet formulation / Weight of formulations = Swelling ratio

5. Drug Content Determination: The percentage drug content indicates how much of the drug was present in the formulation.

6. Percentage Entrapment Efficiency: For assessing the phase distribution of medication in produced formulations, percentage entrapment efficiency proved reliable. Three procedures were used to determine entrapment efficiency: microdialysis, ultra centrifugation, and pressure ultra filtration.
In vitro release tests (USP dissolution apparatus LABINDIA Dissolution 2000) were carried out to determine the amount of medication released during a specific time period. The Franz diffusion cell system and synthetic membrane, as well as several types of dissolution apparatus, were used in the release studies.

8. Fourier Transform Infrared Analysis: Shimadzu's Fourier transform infrared spectroscopy (FTIR) is a technique for identifying organic, polymeric, and certain inorganic materials, as well as determining functional groups. Pure drug, polymer, and drugloaded polymer formulations were measured using Fourier Transform Infrared Analysis (FTIR). The pellets were made on a KBr-press at a hydraulic pressure of 150 kg/cm2, and the spectra were scanned at room temperature throughout a wave number range of 3600 to 400 cm-1.

9. Differential Scanning Calorimetry (DSC): Shimadzu and Toldeo are commonly employed to characterise medicines' water of hydration. A DSC equipment with an intercooler was used to acquire thermograms of prepared formulations. The DSC temperature and enthalpy scales were calibrated using indium/zinc standards. Over a temperature range of 25° C to 65°C, the sample preparations were hermetically sealed in an aluminium pan and heated at a constant rate of 10°C/min.

Application of Floating Drug Delivery Systems:[2,8,9]

1. **Sustained Release Drug Delivery System:**HBS programs can stay in the stomach of for a long time too, so he can take the medicine out for a long time. The problem of short-term abdominal discomfort associated with oral formation of CR which is why it can be overcome with these programs.

These programs have a maximum of <1 as a result they can float in the contents of the stomach. These programs are large in size and passable pyloric opening is not allowed e.g. Strong release of nicardipine hydrochloride tablets is also developed tested in vivo.
The composition is compared to the MICARD tablets on sale using rabbits.Plasma screening time curves showed longer treatment time (16 hours) in loose floating capsules compared to standard MICARD tablets (8 hours)

Site-specific drug delivery: These programs are especially useful for drugs that are concentrated directly in the stomach or in the extra part of the small intestine, e.g. riboflavin and furosemide e.g. Furosemide is mainly absorbed into the stomach followed by the duodenum. It has been reported that a monolithic floating measuring form with longevity in the abdomen was improved and the availability of material availability increased. The AUC found with floating tablets was about 1.8 times that of standard furosemide tablets.

3. **Absorption Enhancement:** Drugs that are not readily available due to location absorption from the upper part of the intestinal tract can be contested they are designed as floating drug delivery systems, thereby increasing their absorption e.g. a significant increase in the availability of floating rate forms (42.9%) would be possible achieved compared to commercial LASIX tablets (33.4%) and enteric LASIX affiliate product (29.5%)

Reference:

1. Chikhalikar SS and Wakade RB: Floating Drug Delivery System – An Approach To Oral Controlled Drug Delivery. International Journal of PharmTech Research 2012; 4(4) 1812-26.
2. Tripathi GK and Singh S: Formulation and In vitro evaluation of pH sensitive oil entrapped polymeric blended buoyant beads of Amoxicillin. Scholars Research Library 2010; 2 (2): 131-38.
3. Burns SJ, Attwood D and Barnwell SG: Assessment of a dissolution vessel designed for use with floating and erodible dosage forms. International Journal of Pharmaceutics 1998; 160: 213–18.
4. Baumgartner S, Kristl J, Franc V, Vodopivec P and Zorko B: Optimisation of floating matrix tablets and evaluation of their gastric residence time. International Journal of Pharmaceutics 2000; 195: 125–35.
5. Kharia AA, Hiremath SN, Singhai AK and Jain SK: Design and optimization of floating drug delivery system of acyclovir. Indian Journal of Pharmaceutical Sciences 2010; 72(5): 599-06.
6. Bhowmik D, Chiranjib B, Margret C, Jayakar B and Kumar KPS: Floating Drug Delivery System-A Review. Scholars Research Library 2009; 1(2): 199-18.
7. Urguhart J, Theeuwes F. Drug delivery system comprising a reservoir containing a plurality of tiny pills. US patent 4 434 153. February 28, 1994.
8. Mamajek RC, Moyer ES. Drug dispensing device and method. US Patent 4 207 890. June 17, 1980.
9. Fix JA, Cargill R, Engle K. Controlled gastric emptying. III. Gastric residence time of a non-disintegrating geometric shape in human volunteers. Pharm Res. 1993;10:1087Y1089.