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Recent Advances in Omeprazole Drug Delivery Systems and Advantages of Magnetic Formulation - A Review

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Abstract

This review presents about the new diverse drug delivery technologies of omeprazole and also to explore it advantages by formulating omeprazole into magnetic tablets. The first marketed proton pump inhibitor was the omeprazole which irreversibly alter the H+/K+ ATPase activity therefore inhibiting the secretion of gastric acid. The gastric parietal cells are responsible for the gastric acid secretion. It is an agent used to prevent infections like stomach ulcers caused by *Helicobacter pylori* and also diseases such as Zollinger-Ellison syndrome, Acid Related Dyspepsia. Nowadays, there are many researchers who have been working to enhance the dissolution, bioavailability of drug, therapeutic efficacy and patient compliance of the various formulations of the proton pump inhibitors. The development of various formulations up to date can be favourable for the drugs to reach their target site and results in effective drug action on its receptor. Even though reaching their target site, it couldn't differentiate the normal cells and infected cells on the target site. Hence if we give it as a magnetic formulation, it can be controlled by external magnetic field to reach their target site without being acted upon the other sites.

Keywords: Omeprazole; Chemistry; Nanoparticle; Microparticle; *In situ* gel**;** Capsule device; Targeted delivery; Magnetic system

Running title: Recent advances in omeprazole drug delivery systems.

1. Introduction

Omeprazole is a non-competitive inhibitor of the gastric proton pump which is the enzyme H+/K+ - ATPase and also a substituted benzimidazole. Therefore, it produces long-term inhibition of gastric acid secretion. It provides effective treatment for the acid related disease in upper gastrointestinal tract because of its tendency to reduce the secretion of acid. [1] Omeprazole reduces the gastric acid secretion in the secretory membrane of the parietal cell by inhibition of the proton pump (H+/K+ - ATPase) in both human and animals. It must be prevented from the acidic nature of gastric juice when taken in oral route because the omeprazole is acid labile. It has very low water solubility [2].

Proton pump inhibitor (PPI) is a prodrug and it is need to be activated by acid. The major compounds of PPI metabolism are CYP2C19 and CYP3A4 polymorphism but the CYP2C19 genotype is responsible for the pharmacokinetics and pharmacodynamics of the drug. Since CYP2C19 sensitivity to S-omeprazole is relatively low, greater intra-gastric pH regulation is attained [3-6].

Omeprazole has extensive metabolism and its protein binding is very high. The elimination half-life of the drug is 1h but it has long lasting pharmacological effect. It is much more concentrated in parietal cells and so the covalent linkage is formed with H+/K+-ATPase which is then inhibits the proton pump irreversibly. The oxidative metabolism of few drugs is inhibited more commonly like phenytoin by omeprazole when it binds with hepatic cytochrome P450 [7-9]. For the treatment of gastric and duodenal (peptic) ulcers, reflux esophagitis, Zollinger-Ellison syndrome, and other gastrointestinal conditions omeprazole is used [10-13]. The goal of this review is to provide advancements in the azole derivative of omeprazole drug delivery technologies that have been developed and also to examine the benefits of formulating it to magnetic tablets.

2. Chemistry

A substituted pyridine ring connected to a benzimidazole by a sulfoxide chain makes up the molecular structure of omeprazole. Fig. 1 depicts the molecular structure. It has a 345 Dalton molecular weight. Due to the fact that omeprazole is a weak lipophilic base, it will preferentially concentrate in an acidic environment, such as the secretory membrane of the parietal cell [14].

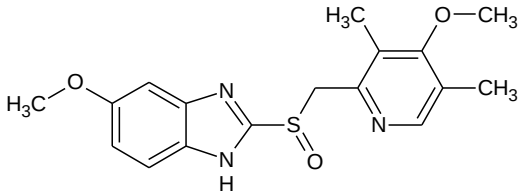

Fig 1.structue

3. Mode of Action

The parietal cell readily absorbs omeprazole. It undergoes protonation in an acidic pH to change to its active form, a sulfenamide. In this form, the medication creates an irreversible disulfide bond with the enzyme H+,K+-ATPase, also known as the "proton pump" (fig. 2), which is in charge of the parietal cells' active secretion of hydrogen ions. Omeprazole differs from other gastric anti-secretory drugs in this way because it acts as a competitive antagonist at cellular receptors on the basolateral side of the parietal cell. Omeprazole prevents the production of stomach acid in response to all recognized stimuli, including intracellular agents like dibutryl cyclic adenosine monophosphate (db-cAMP), owing to its irreversible suppression of H+, K+-ATPase [14].

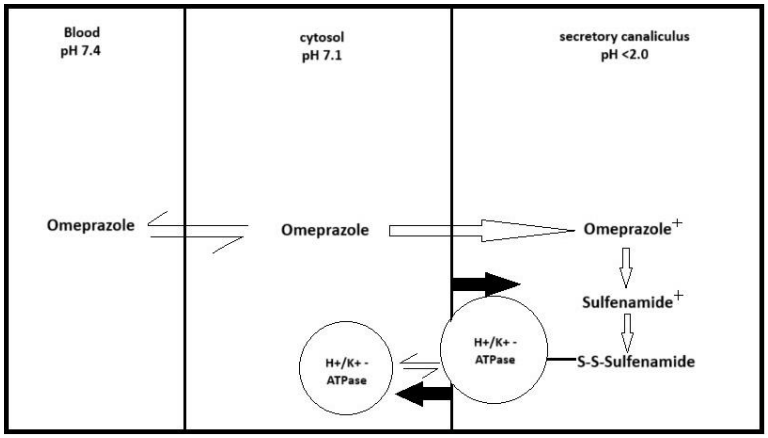

Fig.2.Mechanism of action of Omeprazole on Gastric Parietal Cell. The H+/K+ ATPase switches from being inactive in cytoplasmic vesicles to being active in the secretory canalicular membrane in response to the right stimuli. Omeprazole readily moves into the cytoplasm. It is protonated and converted into sulfenamide in the canaliculus, where it is attached covalently to the H+/K+ ATPase by disulfide bonds and prevents

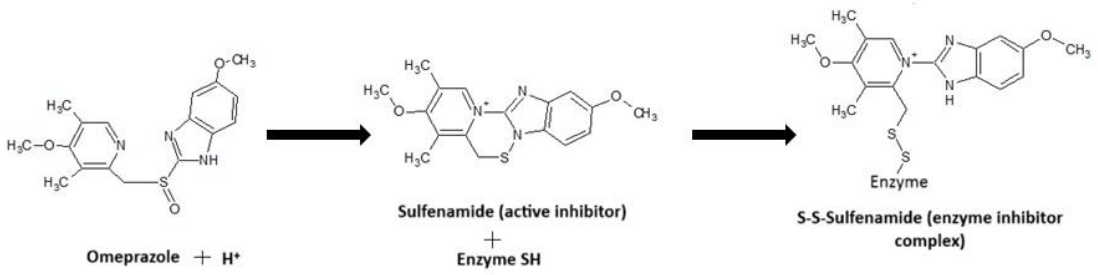

Fig.3.Interaction of activated form of omeprazole with gastric H+/K+ ATPase

4. ADVANCED DRUG DELIVERY SYSTEMS

4.1.Omeprazole nanoparticles suspension

Omeprazole (OME) is frequently used to treat diseases associated with gastric hyper secretion in children; however a liquid paediatric formulation of this medication is not yet available. In order to obtain a liquid therapeutic dosage form OME-loaded nanoparticles was created. The inner core of the nanoparticles was made of pH-sensitive Eudragit® RS100, and the exterior coating was made of pH-sensitive Eudragit® L100-55. The in vivo pharmacological evaluation revealed that nanoparticles can prevent mouse stomachs from ulcer formation. The produced suspension of OME nanoparticles represents a successful therapeutic method in a liquid pharmaceutical form, including paediatric administration flexibility. Enteric coating is a useful method for improving drug stability and preventing drug breakdown caused by acid pH. The pH-sensitive polymeric nanoparticles are efficient carriers for regulated oral medication administration, with the added benefit of protecting the drug from breakdown in an acidic environment [15-20].

A colloidal dispersion of nano-sized drug particles stabilized by a polymer, a surfactant, or both is referred to as a nanosuspension. Nanosuspensions can improve the solubility of drugs in aqueous or lipid solvents. Nanosuspensions boost the solubility and dissolving rate of poor soluble drugs due to their huge surface area. Because of this mechanism, nanosuspension formulations of Biopharmaceutical classification system (BCS) Class II and IV drugs have increased bioavailability, rapid action, and other biopharmaceutical benefits [21-23].

4.2.Solid Self-NanoEmulsifying Drug Delivery System

Omeprazole has a low bioavailability due to its weak water solubility, low stability in acidic conditions, and first pass metabolism. The goal was to create a novel dosage form of omeprazole with improved solubility/dissolution rate and stability by creating a Solid-Self NanoEmulsifying Drug Delivery System (SNEDDS) and loading it in enteric coated Hard Gelatin Capsules (HGCs). This was accomplished by combining the SNEDDS and Liquisolid solubility enhancing approaches. To prevent damage to the drug from the stomach's acidic environment, enteric coated HGC was then added to the Solid-SNEDDs.

Solid-SEDDS packed in HGC have several benefits over liquid and semisolids filled in gelatin capsules, including improved patient acceptance, lower cost than SGC, and better chemical and physical stability. Self-emulsifying and micro-emulsifying drug delivery systems (SEDDS and SMEDDS) are promising strategies that can be utilized to improve the dissolving of drugs that aren't highly water soluble. Avoiding the GIT dissolution stage, this is frequently the rate-limiting step in their bioavailability. The increased surface area on dispersion, further solubilization in the GIT by bile fluids, longer time for dissolution and absorption from the lipid phase due to its inhibition of gastric destruction, membrane induced permeation changes by the surfactant, and enhanced accumulation in Peyer's patch for lymphatic transport all contribute to an improvement in the drug's bioavailability [24-27].

4.3.Omeprazole Suppository for Infants

Infants with gastroesophageal reflux disorder (GERD) receive acid suppression therapy with PPIs. GERD frequently affects new-borns who have congenital defects such as esophageal atresia (EA) or congenital diaphragmatic hernia (CDH). For infants younger than one year of age, however, omeprazole is not commercially available in an oral dose form that is registered for use in adults. Infants require a different dosage due to their small size. Additionally, oral tablets or capsules are difficult for new-borns to swallow. Omeprazole micro granules are typically crushed in clinical practice before being supplied as extemporaneous formulations, which may damage the enteric coating.

Therefore, although this has not been researched in the child population, the oral bioavailability of these spontaneous omeprazole dosages may be unexpected and result in varying degrees of drug exposure. This may also explain why omeprazole is said to be ineffective in treating GERD in young children. Omeprazole administration through a stomach tube frequently results in omeprazole deposits and tube obstruction, especially in new-borns who require nasogastric tube feeding. For the babies and their parents, changing the nasogastric tube is a very distressing procedure.

It is evident that the present oral omeprazole administration to new-borns leads to variable exposure levels and increases the burden on patients and parents. The drug compliance is decreased as a result, which has a negative impact on clinical outcomes. Rectal administration may be able to overcome the drawbacks of oral omeprazole in order to improve the efficacy of omeprazole therapy in new-borns. Moreover, suppositories offer a safer drugs delivery method when young infants refuse oral formulations. [28-34]

4.4.Microfluidic-based omeprazole cellulose acetate phthalate nanoparticles

Microfluidic (MF) nanoprecipitation technology is used to create omeprazole (OME)-loaded cellulose acetate phthalate nanoparticles (CAP NPs) for antiulcer testing. Although the process of nanoprecipitation has many of the above-mentioned benefits, it also has some serious drawbacks, particularly when it comes to BM-based nanoprecipitation (bulk mixing). These drawbacks include insufficient continuity, slow and uncontrolled mixing of two phases that results in chemical and mechanical fluctuations, mass transfer restrictions, and the formation of non-homogeneous NPs. Microfluidics (MF), a reliable and useful technology, is introduced to address this issue[35-37]. A variety of NPs in the micro- to nano scale size range, particularly those for drug delivery, can be produced effectively using MF technique. It may be caused by high repeatability, low sample consumption, large surface to volume ratios, adequate heat and mass transfers, parallelization capability of MF chips to achieve high throughput, and rapid and controlled mixing of phases leading to formation of smaller NPs with a narrower size distribution and higher encapsulation efficiencies [38-40].

Because of their unique features, nanoparticles have been studied for use in a number of biomedical applications [42-43]. The understanding of steric stabilization, which can increase particle stability in the biological environment and provide opportunities for the application of nanoparticles in the development of drug delivery systems (DDSs) for achieving drug targeting and controlled drug release, is already well known as one of the major advancements in the relative application of nanoparticles. Nano crystalline

silver particles (AgNPs) are widely used in the production of sensors as well as in biomolecular recognition, very sensitive anti-microbial treatment, and catalysis [44-48]. The NPs are used in a variety of medical applications, including magnetic resonance imaging (MRI) that targets specific tissues and cell types and image quality, medication, and tissue. This is especially true for AgNPs, which broadly cover a wide range of industrial and medical uses. An important class of nanomaterial for numerous industrial and medicinal applications is AgNPs. AgNPs' distinctive chemical characteristics make them a promising targeted delivery method for medications or gene-specific cells. AgNPs are a more effective drug carrier due to their predicted antibacterial properties.

In combination with silver nanoparticles, omeprazole sulfide is considerably more effective than silver omeprazole and has also demonstrated stronger antibacterial characteristics. In comparison to omeprazole, the combination of the two medications was also mild. The absence of bacterial growth in diameter leads to the conclusion that Ag-omeprazole and Ag-omeprazole-sulfide alone do not have an antibacterial effect, but that the impact is improved by the addition of silver [41].

4.5.Floating In Situ Gel Of Omeprazole Magnesium For Oral Drug Delivery System

Esophagitis that has erosive characteristics and is brought on by gastroesophageal reflux disease can be treated with omeprazole magnesium. One of the most often recommended proton pump inhibitors for treating peptic ulcer disorders. By giving a medication in the form of an in situ floating gel dosage form, the therapeutic concentration of a drug in the blood can be kept stable for a long time. It is administered as an in situ gel because omeprazole magnesium degrades at low pH levels in the esophagus and stomach. This minimizes contact with these acidic pH levels [49].

4.6.Omeprazole-Based Chitosan Coated Nanoemulgel Formulation

Based on the clear anti-microbial properties reported in the literature, this study explores the potential of omeprazole to treat skin and soft tissue infections. Olive oil, carbopol 940, Tween 80, Span 80, and triethanolamine were used to create a chitosan-coated, omeprazole-loaded nanoemulgel formulation that was skin-friendly utilizing a high-speed homogenization process. Gelling agents can easily be added to this drug delivery method to create a nanoemulgel, ensuring the best possible therapeutic dosage is administered through the skin. Nanoemulsion globules are trapped in nanoemulgels by a polymer or gelling agent-created three-dimensional network. Additionally, it has dual-release control mechanisms (hydrogel and nanoemulsion) and nano-sized particles that facilitate rapid distribution and penetration of the active medication. The authors also noted that omeprazole was discovered to bind to both gram-positive and gram-negative bacteria, including H. pylori. A nanoemulgel formulation of OMP was created using chitosan as the main ingredient and a high-speed homogenization procedure. Omeprazole is primarily used to treat H. pylori, and no additional research has been done on using it topically to treat skin microbial infections. According to the results of the current investigation, omeprazole is effective in treating microbiological infections [50].

4.7.Omeprazole Tablets using Hydroxypropyl Methylcellulose Acetate Succinate (HPMC-AS)

The dosage form in a delayed release tablet is released after a predetermined amount of time so that it can pass through the upper GI and reach the bowel. To accomplish this, a polymer that serves as a barrier and prevents medication disintegration in acidic pH is frequently coated on the dosage form. Drugs that are unstable in the stomach environment can also be protected from degradation by enteric coating. Additionally effective method is the use of enteric coating to target medications (such as gastro-resistant ones). The formulations of enteric coated tablets are thought of as delayed action delivery system. Omeprazole is acid-labile and breaks down rather quickly at pH levels below 5.10. Enteric coating frequently uses polymers including hydroxypropylmethylcellulose, hydroxypropylmethylcellulose phthalate, cellulose acetate phthalate, polyvinyl acetate phthalate, and methyl methacrylate. The hydrophilic hydroxyl groups of the HPMC backbone are combined with hydrophobic acetate groups and ionizable succinic acid groups to create HPMC-AS, a semi-synthetic molecule. Increased inherent lipophilicity and pH-specific solubility, which were not previously native to the polymer, are produced by this modification in chemistry. Due to this change, HPMC-AS stands out among other candidates for enteric coating [51].

4.8.Diclofenac Sodium (Mini Tablet) and Omeprazole Sodium as a combined dosage forms in Capsule Devices

The creation of systems that are secure, repeatable, and efficient is the aim of caplet development. Because diclofenac sodium has a short half-life, a combination of diclofenac sodium sustained release [DIC-SR] and omeprazole sodium-enteric coated was created to reduce the frequency of drug administration while also limiting the side effect on the stomach. Wet granulation was used to create the DIC-SR matrix, which releases the medication over the course of 12 hours. One mini-tablet containing 20 mg of Omeprazole and 50 mg of diclofenac sodium sustained release was placed inside of a capsule to create a caplet [52].

4.9.Duodenum-targeted delivery of omeprazole using Prosopis gum matrix

A hydrophilic polymer called prosopis gum (PRG) can be obtained from prosopis Africana seeds. The utilization of the gum for omeprazole administration to the duodenum is the subject of this study. The jejunum and duodenum have the largest surface areas because villi and microvilli are concentrated there in the highest amounts. The duodenum is a good target for drug delivery because of its large surface area and quick transit time, which are less erratic than those of the colon. The easiest way to achieve targeted drug delivery to the duodenum is to prevent drug release in the stomach by adding pH-dependent solubility characteristics to the dosage form. This can be done by coating the dosage form with an outer enteric polymeric film coat or dispersing the drug in a matrix with the right swelling and solubility characteristics. But creating a matrix tablet is more cost-effective. As PRG generated tablets with a 5-hour drug release when employed as a binder at concentrations of 8 and 10%, making omeprazole pills with reasonably high and regulated concentrations of the gum could ensure delaying drug release and targeting

the duodenum. Additionally, omeprazole's gastrointestinal breakdown could be inhibited by a polymer, according to the recent findings of this study [53].

4.10. Immediate Release Solid Dosage Forms Of Omeprazole

Due to its ease of self-management, compactness, and simple manufacture, the tablet is the most widely used dosage form currently available. Solid dose forms are more effective when superdisintegrants are utilized. The use of superdisintegrants such as sodium starch glycolate and sodium lauryl sulphate, among others, is the fundamental method employed in the formulation of the pill. After administration in the stomach, these superdisintegrants offer fast pill disintegration. The quick breakdown may be caused by the medium's quick absorption of water, which would cause a burst effect and increase bioavailability. The main reasons why tablet formulations are favoured are their greater stability and reduced manufacturing, packaging, and shipping costs. Tablets are one of the most popular as well as economically successful drug delivery courses of therapy, along with a variety of dosage forms used for oral medication administration. This is because tablets offer multiple returns over other dosage forms.

For the administration of poorly soluble medications containing high molecular weight proteins and peptides, the development of improved oral protein delivery technology using immediate release tablets that may release the drugs at an improved rate is particularly encouraging. Because of its low cost of manufacturing, simplicity of administration, and high levels of patient compliance, the oral route continues to be the best way to provide therapeutic medicines. Many patients need a certain therapeutic condition to start working quickly, thus a fast release of the medication is necessary. The prevalence of ineffective therapy is substantial because it is thought that 50% of the population is impacted by this issue. "Immediate release" means any formulation used in pharmaceutical products must not purposefully or noticeably slow down the rate of drug release from the formulation or absorption. In this instance, immediate release may be achieved using a suitable pharmaceutically acceptable diluent or carrier that does not appreciably slow down the rate of drug release and/or absorption. Thus, the phrase does not include formulations that have been adjusted to provide for "modified," "controlled," "sustained," "prolonged," "extended," or "delayed" drug release [54].

4.11. Omeprazole Magnesium Multi-Unit Particulate Controlled Release Tablets

Multi-Unit Particulates (MUPs) with matrix pellets are used to develop controlled release products of various active pharmaceutical ingredients. They may allow improvement in solubility and there by bioavailability of poorly soluble drugs. Omeprazole magnesium is a derivative of benzimidazole which belongs to the group of proton pump inhibitors that exhibits degradation in gastric acid with short biological life and variability in bioavailability. The drug degradation problem was overcome by the coating of pellets with enteric coating agents that disperse in the gastrointestinal tract more homogenously than single units with a rapid transit time.

Because of its capacity to regulate drug release as well as their facilitation of altered drug release patterns, oral Multi-Unit Particulates Drug Delivery Systems (MUPDDS) have grown in significance in recent years. Preparing multiple unit dosages has the benefit of reducing both inter- and intra-subject variability in absorption, which supports the concept that a delayed-release multiple unit particle system is a

potential method for the delivery of medication. To provide an enteric coating for the omeprazole magnesium, soothing agents (Eudragit L100 55 polymer) were employed. PlasACRYL T20 was employed because of its effective anti-tracking qualities to manage agglomerates during the coating process. To give the film more flexibility during the coating process, triethyl citrate was utilized. Talc is also used to prevent the enteric coating of the pellets from breaking during tableting, which will eventually result in the deteriorated form in an acidic environment. Talc was also used to prevent the sticking of polymer-coated beads [55].

4.12. Buccal Foams

Omeprazole (OME)-containing buccal foams have been created as prospective drug delivery systems for those who have trouble with swallowing, especially children and the elderly. The lyophilized aqueous gels of maltodextrin, which is used as a sweetener, were mixed with different polymers (alginate, chitosan, gelatin and tragacanth) to customize their structural, mechanical, and physicochemical properties to create the buccal foams. The foam made of hydroxypropyl methylcellulose and alginate (HPMC-Alg-OME), which met the criteria for effective drug delivery across buccal epithelium, displayed moderate hardness and high mucoadhesion, which led to prolonged residence and increased transport of the active across porcine epithelium. Compared to the drug suspension, the HPMC-Alg-OME foam increased the drug's apparent permeability through pig buccal tissue by 30 times. When applied to the buccal mucosa, buccal foam instantly transforms into a mucoadhesive hydrogel film, ensuring rapid omeprazole release and effective drug delivery, in contrast to existing buccal formulations, which may take over an hour to completely dissolve. This feature may greatly improve omeprazole buccal administration patient compliance and treatment adherence in the juvenile and geriatric patient populations [56].

4.13. Omeprazole microparticles modified with Pulsed plasma surface

Using the precursor monomers methacrylic acid (MAA) and methyl methacrylate (MMA), pulsed radio frequency plasma (PRFP) was employed to functionalize omeprazole (OME) microparticles. The usage of methyl methacrylate (MMA) and methacrylic acid (MAA) as prospective candidates for coating medications to prolong their release. The fourth state of matter, plasma, has proven to be a promising technology for modifying solid surfaces and incorporating thin-film coatings. Non-thermal plasma, in contrast to other surface modification or functionalization techniques, offers distinctive surface chemistry, effective monomer cross-linking, conformal and pin-hole free coatings with excellent adhesion, reduced drug leaching, improved biocompatibility, and good control over the degree of hydrophilicity/hydrophobicity. The plasma treatment procedure uses less monomer, and it is generally a green process. Plasma-modified powders of pharmaceutical grade reduce surface roughness by etching. This could lessen the attraction between the particles known as Van der Waals force, improving the bioavailability of the medicine being administered. In order to provide graded deposition on the surface of the OME for delayed release applications, this research effort utilised PRFP technology to manage film chemistry by systematically altering the rate of deposition. Here, the surfaces of OME microparticles modified using a spinning RF plasma reactor that was constructed in the lab and is hermetically sealed. Utilizing precursor monomers MAA and MMA (1:2) in the vapour phase, plasma polymerization was

done to functionalize OME. By maximizing the plasma's parameters, this is accomplished. The surface-modified OME demonstrated exceptional resistance to stomach acid and delayed release at lower pH [57].

5. CLASSIFICATION OF GASTRO-RETENTIVE DRUG DELIVERY SYSTEMS

In the recent decades, several technologies have evolved showing different mechanisms for retaining the drug in GI region for longer duration (increasing gastric residence time) with increased bioavailability. The different strategies are seen in fig.4.

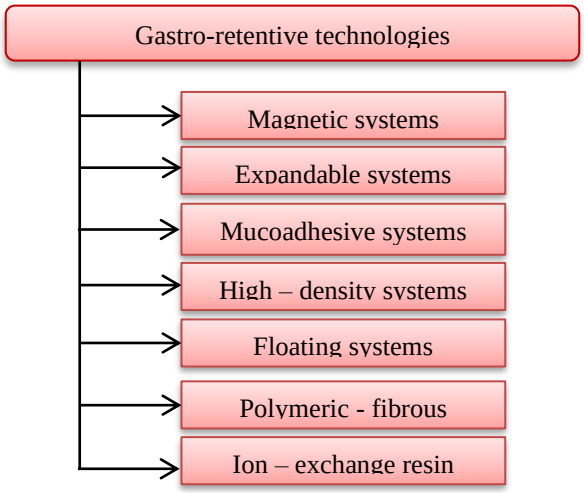

Fig.4.Different Types of gastro-retentive systems

5.1. Magnetic systems

Apart from the API and excipients, the dosage form's distinctive characteristic in magnetic systems is a small quantity of internal magnet. To regulate where the dose form is put, an extracorporeal magnet is positioned above the stomach. It has been observed that employing magnetic tablets improves the gastric residence time (GRT) and bioavailability of medications. The position and magnetic intensity of the extracorporeal magnet can impact the stomach retention behaviour of the magnetic systems [58]. Accordingly, depending on how long the magnet is retained, these devices offer improved GRT. Patient compliance may occasionally be impacted by placing the external magnet in a precise location outside the abdomen for an extended period of time [59].

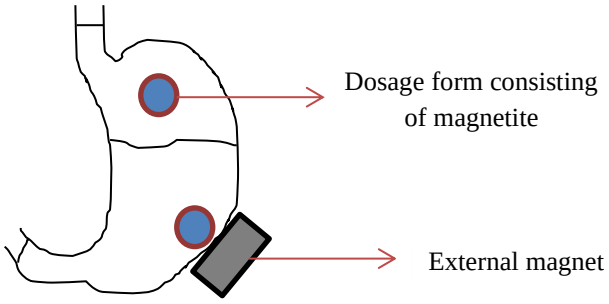

Fig.5.Schematic view of magnetic dosage form

A biomagnetic approach called Alternating Current Biosusceptometry (ACB) is suitable for a variety of biological applications. To monitor solid dose forms in various GI segments, a single sensor ACB may be employed. This method permits the measurement of the transit times via the small intestine, the orocaecum, and the stomach region. Furthermore, using a single sensor ACB, a defined area may be scanned to produce magnetic pictures of the breakdown of solid dosage forms, which are then measured by the image area variation. This approach was taken to evaluate the floating lag time and tablet hydration rate of floating tablets in vitro, in vivo pictures of the disintegration of magnetic enteric coated tablets, and the impact of immunosuppressive medication on GI transit. The multi-sensor ACB system also allows for the real-time acquisition of magnetic pictures without the requirement for scanning by concurrently acquiring signals from many places. Using this method, it was possible to examine how different compression force levels affected tablet disintegration in vitro, colonic and stomach contractility in vivo, as well as colonic motor activity in response to a meal. The ACB method has therefore been demonstrated to be a trustworthy technique for evaluating the interaction between GI motility and medication release.

A pharmacomagnetography study evaluates both the position of a solid dose form in the GI system and the medication plasmatic concentration. The Magnetic Marker Monitoring (MMM), which measures the magnetic field of magnetized tablets using multichannel superconducting interference devices (SQUIDs), is a magnetic technology that is ideal for finding solid dosage forms in vivo. The MMM has recently been used in pharmacomagnetography applications to study the relationship between medication bioavailability and intra-gastric tablet deposition as well as the bioavailability of prolonged release tablets under fasting and fed settings. MMM have a number of drawbacks that prevent its widespread adoption, including its high implementation costs and need for a magnetically protected space. ACB, on the other hand, is a low-cost and adaptable approach that may be used in both labs and clinics without the need for a magnetically shielded environment [60].

DISCUSSION:

This review discussed the recent formulations of omeprazole such as in-situ gel, nanoemulgel, nanoparticles, microparticles etc. These formulations are developed to enhance the dissolution rate by using various polymers and also have the ability to improve the bioavailability and patient compliance. Additionally, the dosage form may be impacted by the molecular weight, viscosity, and physiochemical characteristics of polymers. If the dosage form is altered, then the bioavailability of the drug also gets affected.

In recent years, the magnetic formulation became admired due to its improved gastric-residence time and also increased bioavailability. It can be controlled by the external magnetic field to reach their target site and it can also be monitored in-vivo by the technology called magnetic marker monitoring. By using this technology we can find the solid dosage form deposition and their bioavailability.

CONCLUSION:

Omeprazole can be formulated into various delivery systems to improve their efficiency in-vivo. But, the magnetic formulation is the system that helps for targeted delivery. It can also be feasible to identify whether the drug has reached their targeted site or not. Therefore, omeprazole can also be formulated in magnetic tablet and it also an added technology that will provide promising improvement in the formulations of omeprazole.

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