

MAGNETICALLY CONTROLLED PILLS: NEW ERA IN DRUG DELIVERY SYSTEMRajiv Jaithlia*¹, Sunil Thakral², Nishima Agarwal³¹Lachoo Memorial College of Sciences and Technology, Jodhpur, Rajasthan, India²Gurukul College of Pharmacy, Suratgarh, Rajasthan, India³B.N. Girls College of Pharmacy, Udaipur, Rajasthan, IndiaCorresponding Author's Email: rajivjaithlia@gmail.com

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ABSTRACT: As orally administered pill often will not dissolve at exactly the right site in the gastrointestinal tract where the medicine can be absorbed into the bloodstream, so a new drug delivery system developed which includes magnetic pill (tiny magnet inside a gelatin capsule) which solve the problem by safely holding a pill in place in the intestine wherever it needs to be. The two main component of the system are conventionally-looking gelatin capsules that contain a tiny magnet, and an external magnet, external magnet use to guide the location of that capsule in intestine. This new technology can be used as a new drug delivery method for cancer drugs or drugs targeting GI diseases.

Keywords: Magnet pills, magnetically controlled pills, GI diseases, Target drug delivery, Colonal drug delivery

INTRODUCTION

Many people would rather take drugs orally than via injection, but the main problem with administering medications orally is that a pill often will not dissolve at exactly the right site in the gastrointestinal tract where the medicine can be absorbed in to the bloodstream. Hence a new drug delivery system i.e. magnetic pill system was developed which can solve the problem by safely holding a pill in place in the intestine wherever it needs to be. The two main components of the system are conventional-looking gelatin capsules that contain a tiny magnet and an external magnet.^{1,2,3} In particular, the researchers envision that the technology could be used as a new drug delivery method for cancer drugs or drugs targeting GI diseases, as there are a number of therapeutics that would benefit from prolonged localization at their site of action or at the site of greatest absorption. The research is still in the early preclinical stages, but it's promising that the researchers have been able to overcome the hurdle of making the system safe for use in the body. According to the statement, even after holding a pill in place for 12 hours in the rats, the system applied a pressure on the intestinal wall that was less than 1/60th of what would be damaging. Magnetically localized pills serve as a platform technology for addressing a broad array of issues facing the implementation of disease therapies. In particular, therapeutics exhibiting optimal absorption within a limited region of the GI and those therapies that target GI ailments have immediate potential for exploration by using our system and guidelines for magnetic pill retention. This technique is readily applicable to investigating the therapeutic benefit of prolonged local delivery of NAW therapeutics (e.g., acyclovir, bisphosphonates, furosemide, levodopa, and metformin) at their sites of greatest absorption (4, 5). Additionally, localized oral delivery of polymer nanoencapsulated proteins within specific regions of the GI, genes, and antibodies within the small intestines demonstrated tremendous potential to enable conversion to oral delivery of biologic therapies currently delivered by

injection (6–11). Similarly, localized oral delivery to the ileum would expose vaccines to GALT increasing their contact with the immune system (4, 12)

WORKING

The two main components of the system are conventional-looking gelatin capsules that contain a tiny magnet and an external magnet that can precisely sense the force between it and the pill and vary that force, by varying the external magnetic force the capsule can be held at a specific location. The magnetic force is precisely controlled to avoid damaging surrounding tissue. The pill's retention works by creating an inter-magnetic force between the magnetic gelatin capsule and an external magnet. Magnetic capsule in the body placed t right place by the magnet outside which create a magnetic attraction and force to locate the magnetic capsule.^{2,13-15}

Challenges for system

The system is not the first attempt to guide pills magnetically, but it is the first one in which scientists can control the forces on a pill so that it's safe to use in the body. They designed their system to sense the position of pills and hold them there with a minimum of force.

The greatest challenges were quantifying the required force range for maintaining a magnetic pill in the small intestines and constructing a device that could maintain inter-magnetic forces within that range.

⇒ To check whether the pills is reach to the exact place can check by taking some blood samples and to check bioavailability of the same drug.^{2,14-16}

Applications in Drug Delivery:

- This technology is very applicable to humans especially in patients with cancer and diabetes and GI diseases.
- The use of a magnet ensures the pill stays at the target therapeutic area for longer, which helps the

drug's uptake and bioavailability without damaging intestinal tissue.

- Use for targeting GI cancers, other GI diseases, and being used to administer drugs orally that currently suffer from poor oral absorption¹⁶⁻¹⁸
- In particular, the researchers envision that the technology could be used as a new drug delivery method for cancer drugs or drugs targeting GI diseases, as there are a number of therapeutics that would benefit from prolonged localization at their site of action or at the site of greatest absorption.
- Another avenue for the application of magnetic pill localization is the treatment of GI pathophysiologies including esophageal, gastric, intestinal, and colorectal cancers (19-22).

- Magnetic localization of chemotherapeutics at the site of GI tumors, which are simultaneously identifiable on X-ray following intravenous administration of radioopaque contrast, would enable localized dosing while minimizing side effects associated with systemic administration (11, 19).
- Finally, magnetically localized oral delivery of therapeutics for GI diseases including severe cases of Crohn's disease and acid reflux enables administration directly at the affected site without requiring direct visualization of the pathophysiology in question (4, 11)

Futuristic approach

The next step is to move study to larger animal models and ultimately into the clinic.¹⁶⁻¹⁸

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