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Review Article

A Review on Sustained Release Matrix Tablets

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Abstract:

A sustain-release matrix tablet is a pharmaceutical dosage form designed to deliver medication over an extended period. These tablets are engineered to provide a controlled and consistent release of active ingredients, ensuring therapeutic efficacy while reducing dosing frequency and minimizing side effects. This review article will delve into the key aspects of sustain-release matrix tablets, including their benefits and drawbacks. We have discussed about various evaluation such as tablet dimension, hardness, friability, drug content uniformity, weight variation, swelling index as well as *in vitro* dissolution test. Sustained release matrix tablets have broad applications in many therapeutic areas where consistent and prolonged drug release is essential for maintaining therapeutic efficacy, improving patient compliance, and minimizing side effects. The choice to use such tablets depends on the specific drug, patient needs, and the desired therapeutic outcome.

Key Words: Matrix tablet, Friability, Swelling index, Therapeutic efficacy.

Introduction

Any drug delivery system's goal is to deliver a therapeutic quantity of medicine to a specified place in the body on time and then maintain the appropriate drug concentration. Sustain release systems are any drug delivery methods that achieve gradual drug release over a lengthy period of time. [1]

A matrix tablet, which contains a solid drug distributed in an insoluble matrix, may provide prolonged drug administration. The drug in the bathing solution-exposed outer layer is dissolved first and subsequently diffuses out of the matrix. The rate of drug release is determined by the rate of drug diffusion rather than the rate of solid disintegration.

Sustain-release matrix tablets are a vital tool in modern pharmaceutical science. They serve the purpose of maintaining constant drug levels in the bloodstream, optimizing therapeutic outcomes, and improving patient compliance. The concept revolves around a matrix system, wherein the active ingredient is dispersed uniformly in a solid or semi-solid matrix. This matrix retards the release of the drug, resulting in a controlled and prolonged delivery. [2]

The composition of a sustain-release matrix tablet involves careful consideration of several factors, including the choice of matrix material, drug properties, and excipients. Common matrix materials include hydrophilic polymers (e.g., HPMC, PVA), lipids (e.g., waxes), and

hydrophobic polymers (e.g., ethyl cellulose). The drug is usually incorporated as a finely divided powder or in a granulated form. The selection of excipients depends on various factors, such as matrix material, drug solubility, and desired release profile. [3]

Benefits Of Sustained Release Matrix Tablet [4]

Sustain-release matrix tablets offer numerous advantages:

- **Improved Patient Compliance:** Reduced dosing frequency enhances patient adherence to the treatment regimen.
- **Minimized Side Effects:** By maintaining constant drug levels, these tablets can minimize fluctuations that may lead to adverse effects.
- **Optimized Therapeutic Efficacy:** They provide a more consistent drug concentration, optimizing therapeutic outcomes.
- **Reduced Healthcare Costs:** Fewer doses and reduced hospital visits can lead to cost savings for patients and healthcare systems.

Drawbacks of Sustained Release Matrix Tablet [5]

- Reduced scope for dosage modification.
- Enhance the potential for first-pass metabolism.
- Patient education is required for appropriate medication.
- It is possible to reduce systemic availability.
- Dose dumping

Evaluation of Sustained Release matrix tablets [6-10]

a. Dimension (thickness and diameter):

The thickness and diameter of tablets were important for uniformity of tablet size. The thickness and diameter of the tablets was determined using a vernier caliper. Ten tablets from each type of formulation were used and average values were calculated.

b. Tablet Hardness:

The hardness of the tablet is measured to ensure it meets the desired mechanical properties and doesn't disintegrate prematurely. Hardness of tablets is the amount of force needed to split them. Both Monsanto and Pfizer type hardness tester were used to determine the hardness of the formulated tablets. The hardness was calculated as kg/cm^2.

c. Tablet Friability:

Friability testing assesses the tablet's resistance to abrasion, ensuring it doesn't break down during handling and storage. The Roche friabilator was used to measure friability of the formulated tablets. Weight of 20 tablets was measured and placed in the friabilator chamber. The friabilator was rotated at speed of 25 rpm for 4 min. After completion of 100 revolutions, the tablets were weighted again and % weight loss is calculated, which corresponds to friability.

$$\%\ Friability = \frac{Initial\ weight - Final\ weight}{Initial\ weight} \times 100$$

d. Content Uniformity Testing:

It is essential to ensure that each tablet contains the intended amount of drug. A random sample of tablets is tested for content uniformity to confirm dose consistency. Utilize the powder of 20 tablets. Weighed 0.1gm drug powder with 150 milliliters of phosphate buffer pH 6.8 about 10 minutes, then added more phosphate buffer pH 6.8 to make 200 ml and filtered. Dilute ten milliliters of filtrate with 100 mL of water and check the absorbance at 233 nm.

e. Weight variation:

To study the weight variation, 20 tablets of each formulation were selected at random and determine their average weight. Not more than 2 of the individual weights may deviate from the average weight by more

than the % deviation and none should deviate by more than twice that percentage.

f. Swelling Index:

The swelling behavior of a dose unit was studied by weight growth. The swelling index of tablets was calculated by putting them in a petri dish and dissolving them in 0.1N HCL (pH 1.2) as well as pH 7.4 phosphate buffer. After one, two, four, six, and eight hours. Each tablet was gently removed and wiped using tissue paper to get rid of for each time period.

g. *In-vitro* Dissolution Studies

Dissolution studies of matrix tablets are performed to ensure sustained release of the drug for longer duration. Dissolution studies of prepared matrix tablets was performed in two steps. Initially, Acid buffer pH 1.2 (corresponding to gastric environment) was used as dissolution media for initial two hours. Then, the dissolution media was replaced with Phosphate buffer pH 6.8 (corresponding to intestinal environment) as dissolution media for next ten hours. Paddle apparatus was used for dissolution studies at 50 RPM and $37^0 \pm 0.5^0$C.

Applications of Sustained Release Matrix Tablets: [11-14]

a. Pain Management:

Chronic pain conditions often require around-the-clock medication to maintain pain relief. Sustained release matrix tablets can be used to deliver analgesics, such as opioids or non-steroidal anti-inflammatory drugs (NSAIDs), steadily over an extended period, reducing the need for frequent dosing.

b. Hormone Replacement Therapy (HRT):

Hormone replacement therapy often involves long-term treatment with hormones such as estrogen or progesterone. Sustained release tablets can provide a controlled and consistent hormone delivery, reducing menopausal symptoms and improving patient compliance.

c. Antibiotics:

Some antibiotics, particularly for chronic or recurrent infections, can be formulated as sustained release tablets to maintain therapeutic concentrations over a more extended period, ensuring the complete eradication of bacteria.

d. Cardiovascular Diseases:

Medications for heart conditions like hypertension, angina, and arrhythmias often benefit from sustained release formulations. These tablets can help maintain steady blood pressure and reduce the risk of adverse events.

e. Alzheimer's Disease and Dementia:

Sustained release matrix tablets can be used for medications that slow the progression of neurodegenerative diseases like Alzheimer's by providing a more consistent delivery of drugs affecting cognitive function.

f. Allergic Conditions:

Antihistamines, bronchodilators, or corticosteroids used in the management of allergic conditions like asthma and allergies can be delivered through sustained release matrix tablets to provide symptom relief over an extended period.

Conclusion

Sustain-release matrix tablets are a valuable pharmaceutical technology that plays a significant role in improving patient compliance, optimizing drug therapy, and reducing healthcare costs. The design, composition, and mechanisms of release are critical considerations in their development. While challenges exist, their application continues to expand across a wide range of therapeutic areas, benefiting both patients and healthcare providers.

In summary, sustain-release matrix tablets are a promising pharmaceutical formulation, offering a controlled,

prolonged release of drugs and improving patient outcomes. Their development requires a deep understanding of drug properties, matrix materials, and release mechanisms. As pharmaceutical science continues to advance, sustain-release matrix tablets will likely remain an essential tool in drug delivery.

References

1. Kumar S, Kant S and Prashar B., Sustained release drug delivery system. a review. International Journal of Institutional Pharmacy and Life Sciences, 2012; 2(3): 356-376.
2. Kumar V, Prajapati SK, Soni GC, Singh M, Kumar N. Sustained release matrix type drug delivery system: a review. World J Pharm Pharm Sci, 2012; 1:934-60.
3. Pandey SP, Khan MA, Dhote V, Dhote K, Jain DK. Formulation development of sustained release matrix tablet containing metformin hydrochloride and study of various factors affecting dissolution rate. Sch Acad J Pharm. 2019; 8(3):57-73.
4. Shukla R, Shaikh S, Damor Y, Jain H, Sahu A, Meshram D.B, A Review on Sustained Release Matrix Tablet, EAS J Pharm Pharma col, 2020; 2(1): 14-17.
5. Chauhan MJ and Patel SA, A concise review on sustained drug delivery system and its opportunities. American Journal of Pharm Tech Research, 2012; 2(2): 227-238.
6. Kumar A, Raj V, Riyaz Md, and Singh S. (2013). Review on sustained release matrix formulations. International Journal of Pharmacy and Integrated Life Sciences, 1(2), 1-14.
7. Kumar SKP, et al. Sustained release drug delivery system potential. The Pharma Innovation, 2012;1(2): 46-56.
8. Joshi J, Bhakuni L, Kumar S. Formulation and evaluation of solid matrix tablets of Repaglinide Der Pharm Sin. 2012; 3:598- 603.
9. Shukla A.K, Singh S.K, Mishra S.P, Sarthi A.S, Dewangan E, Bharti V.R, Sonkar S.K, Development and Characterization of Natural Polymer Based Nifedipine Sustained Release Matrix Tablet, Journal of Pharmaceutical Negative Results, 2022; 13(8): 3663- 3668.
10. Zalte HD, Saudagar RB. Review on Sustained Release Matrix Tablet. Int J Pharm & Bio Sci. 2013;3(4):17-29.
11. Moghal M, Islam M, Ahmed I, Islam M, Rahman H, Development and optimization of sustain release matrix tablet of Ambroxol Hcl using central composite design, IJPER, 2010; 44(1):28-35.
12. Kamboj S, Gupta GD. Matrix tablets: An important tool for oral controlled release dosage forms. Pharmaceutical Rev. 2009;7(6):1-9.
13. Zalte HD, Saudagar RB. Review on sustained release matrix tablet. Int J Pharm Biol Sci. 2013;3(4):17-29.
14. Gurny R, Doelker E, Peppas NA. Modelling of sustained release of water-soluble drugs from porous, hydrophobic polymers. Biomaterials. 1982;3(1):27-32.