A REVIEW ON IMPORTANT OF MATRIX TABLET IN TREATMENT OF VARIOUS DISEASES.

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ABSTRACT:

This article discusses the role of polymers in the regulated distribution of various fast-release drugs, the process of drug release from these polymeric matrices, and a brief review of the various formulation techniques employed in delayed release drug delivery systems.Many medications include an oral controlled release mechanism, which has been recognised as a crucial component of drug delivery system formulation development. Because of its many benefits over traditional dose forms, it has been the subject of pharmacological study for a long time. By delivering the drug for release in the blood at a controlled rate, it is possible to address several problems with conventional dosage forms and keep relatively constant drug levels in plasma throughout a controlled amount of time. These dosage forms are applicable because they decrease the frequency of drug dose, which promotes patient compliance and convenience. Furthermore, it is possible to reduce the large variations in the peak of plasma drug concentration. Consequently, toxicity and ineffectiveness can be prevented, particularly with medications that have limited therapeutic indices. By employing drug delivery methods with delayed release, which provide the medication for absorption and release over an extended period of time, these issues related to traditional dosage forms of many medications can be resolved. It is important to design the controlled release dosage form such that changes in the constituents can result in predictable changes in release of drug from formulation.

KEY WORDS:

Control release of drug system, Bilayer Tablet, Matrix tablet, natural polymer, synthetic polymer, delayed release tablet.

1. INTRODUCTION

The most traditional and preferred method of medicine delivery is oral administration. It is the most advantageous method of medication delivery for patients since it is inexpensive to prepare and simple to administer. Because of their high patient compliance, delayed or sustained release dose forms have been shown to be the most acceptable. According to earlier surveys, almost half of the drugs on the market are administered orally.

1.1 Matrix Tablet

The development of matrix tablets with controlled release has led to a new breakthrough in pharmaceutical technology for creative drug delivery methods. These technologies have often demonstrated appeal among oral controlled drug delivery techniques because to their ease of use, ease of mechanisation, high degree of repeatability, stability of the dosage form and raw materials, ease of scale up, and ease of process validation. Matrix tablets provide potential for the development of extended-release drug therapy as they are the most cost-effective choice for controlled release oral solid dosage forms. The homogeneous

dispersion of the drug or active ingredient throughout hydrophilic or hydrophobic matrices, which function as release rate retardants, is what distinguishes oral solid dosage forms called matrix tablets.

One kind of controlled drug delivery method that releases the medication continuously is the matrix tablet. The drug ingredient, which may be crystalline, amorphous, or in rare instances, a molecular dispersion, is uniformly mixed into the rate-controlling material in a matrix system. These use diffusion-controlled or dissolution-controlled processes to release the medication.

Advantage of Matrix tablet

1. Controlled release provides prolonged therapeutics action and minimizes dosing frequency.
2. Enhanced patient compliance eliminate the need of taking multiple dose.
3. Reduce side effects and maintains constant drug plasma concentration.
4. Natural polymers can be used.

Disadvantage of Matrix tablet

Following medication release, the whole matrix of the matrix tablet needs to be eliminated.

1. High cost of preparation.
2. The matrix tablet is not suitable for all drugs
3. Some parameters like solubility, stability and particle size affect the drug release rate.
4. Hydrophilic and hydrophobic polymer is selected to achieve a desired release profile.

2. TYPE OF POLYMER USED IN MATRIX.

2.1 Hydrophilic matrix system

A hydrophilic matrix can be used to control the rate at which the drug is released. It can be generated by directly compressing the combination of the active ingredient and certain hydrophilic carriers, or it can be made by a wet granulation of the medication and hydrophilic matrix materials. The hydrophilic matrix requires water to initiate the release mechanism and provides several advantages, including ease of manufacture and superior homogeneity of matrix tablets. Drug release is regulated by tablet degradation and the formation of a gel diffusion barrier upon immersion. Numerous researchers have examined how formulation and processing factors affect the behaviour of drug release from compressed hydrophilic matrices.

Cellulose derivatives- Hydroxymethyl cellulose, Hydroxymethyl. cellulose

Natural Cellulose or Synthetic Polymer

Agar-agar, Carob Gum, Galactose

Polymer – Carbopol

2.2 Hydrophobic Matrices

This type of matrix system granulates a drug with a hydrophobic polymer material using latex or fake latex as the granulating fluid. Polyvinyl chloride, ethyl cellulose, cellulose acetate, and polystyrene are some of the components utilised in this system. A network of channels between compressed polymer particles has allowed the dissolving drug to disperse, causing a continuous release. As inert or hydrophobic matrices, materials such acrylate polymers and their copolymers, polyethylene, polyvinyl chloride, and ethyl cellulose have been used. In these formulations, liquid penetration into the matrix is the rate-controlling step.

2.3 Biodegradable matrix system

The polymeric materials utilized in this kind of matrix system are made up of monomers joined by functional groups with unstable functionality.

Polymeric materials are broken down into oligomers and monomers by either non-enzymatic processes or biological enzymes produced by the surrounding tissues. Examples of natural polymers used in this matrix base include proteins, polysaccharides, aliphatic polyesters, and synthetic polymers such polyanhydrides.

2.4 Mineral matrix system

The hydrophilic carbohydrate polymeric material employed in this kind of matrix system may be extracted from several brown seaweed species using diluted alkali.

Matrix system classification according to porosity size:

a. Macro-porous matrix system (pores size 0.1 to 1µm)
b. Micro-porous matrix system (pores size 50 to 200Aº)
c. Non-porous matrix system

Classification based on other different matrix preparation

a. Floating matrix system

Drug molecules may gradually emerge from the matrix. Long-term drug release can extend the duration of stomach residency, increasing the bioavailability of fast-release pharmacological molecules. The stomach's gastric fluid has a higher bulk density than the matrix. Drug release from this hydrophilic matrix structure is facilitated by continuous release and control of the buoyancy effect. HPMC is a typical polymer in this type of hydrophilic matrix system. It has the ability to gel regardless of pH.

b. Multilayered matrix system

While the matrix core is made of hydrophilic materials, the drug molecules in this type of matrix system are coated with a semi-permeable polymeric substance, which is applied as a barrier layer to both of the core's surfaces during preparation. The presence of barrier-layers may change the core's swelling rate, which reduces the surface area available to drug molecules during the release process. Differential drug release characteristics may be achieved by changing the shape of the barrier-layer inside the matrix. The barrier layers in the matrix must first inflate, gel, and then dissolve to control the drug release.

c. Matrix based on pH sensitivity.

In this type of matrix system, the drug can be protected from the harsh, acidic stomach environment by an enteric coating of the solid dosage form. The colon and small intestine can thus safely receive drug molecules that are sensitive to low pH. This type of matrix construction can protect protein molecules or antigen from the harsh, acidic environment of the stomach after oral administration. PH-sensitive polymers such as cellulose acetate phthalate or HPMC-phthalate can be used in this type of matrix system.These polymers are materials that are sensitive to pH. In order for medication absorption to take place in the proper region, this matrix technology releases the enteric coated medicine in the GIT at a particular high pH value.

d. Mucoadhesive type of matrix tablet.

This type of matrix system distributes the medication across a specified period of time. The tissues that may be targeted include the ocular, pulmonary, gastrointestinal, buccal,

nasal, rectal, urethral, and vaginal tissues. Additionally, this type of matrix system can help any mucosal tissue in the body, including the GIT. The components used in this system are swellable hydrophilic polymers, which may interact with the gut mucous layer's glycoproteins. Both hydrophilic and hydrophobic polymers are utilised in the matrix.

3. PRINCIPLE OF DRUG RELEASE IN MATRIX TABLET

Diffusion of the drug will occur in solution, shifting from a high concentration region to a low concentration region. This concentration gradient drives the drug's diffusion out of a system. Water diffuses into the system in a similar manner. Since there is a lot of water in the surrounding medium, the system must allow water infiltration. The water content of the system's interior is initially lower than that of the surrounding medium.

3.1 Factors responsible for release of drug from matrix.

a. Swelling properties of polymers
b. Erosion of polymer
c. Loading of drug
d. Solubility of drug

3.2 Evaluation parameter;

Physical characteristics such as weight uniformity, hardness, friability, dissolving, and stability research were used to assess the matrix tablet.

3.2.1 Test for weight variation

The test was carried out according to the normal methodology, and twenty tablets of each formulation were weighed using an electronic scale to investigate weight variation.

3.2.2 Test for uniformity of weight

Every pill in a batch should weigh the same, and any variations in weight should fall within reasonable limitations. We calculated the weights to within ±1 mg. A sample of 20 pills is used to determine weight control.

3.2.3 Dimensions

The thickness and diameter were then measured to within ± 0.01 mm using digital Verniercalipers.The tablets' thickness was measured with a vernier caliper.

3.2.4 Hardness

Diametric compression was used to measure the tablets' hardness using a Monsanto-type hardness testing apparatus. A tablet hardness of around 4-5 kg is considered adequate for mechanical stability. The tablets' hardness was measured using a Monsanto-type hardness testing apparatus. A tablet hardness of around 5–6 kg/cm2 is considered adequate for mechanical stability.

3.2.5 Friability

The friability of the tablets was evaluated using a Roche friabilator. After being dedusted in a drum for a predefined period of time (100 revolutions), a sample of tablets or tablets with a known weight (W0) are weighed (W) once again. The formula below illustrates how the weight loss was utilised to calculate the % friability. There should be no more than 1% weight reduction per week.

3.2.6 Dissolution study

The United States Pharmacopoeia (USP) dissolving testing equipment II (paddle technique) was used to measure the tablet's release rate. A 900 ml solvent and a predetermined RPM were used for the dissolving test. At various intervals, a sample of

the solution was taken out of the dissolving device. The equal amount of new dissolving liquid was used to replace the samples. A membrane filter was used to filter the samples. A UV double beam spectrophotometer was used to test the absorbance of these solutions.

There are some examples of drug and matrix Tablet

AmbroxylHydrocloride- HPMC-K100M

Diltiazem- HPMC-K100M, HPMC-K4M, Karaya Gum

Furosemide- Guar gum, Pectin

Carbose- HPMC, Eudragit

4. CONCLUSION

From the description above, it can be seen that sustained released matrix tablets, which are made possible by a logical mix of polymers, are useful for both enhancing patient compliance and boosting medication efficiency. Because the systems are created using widely accessible polymers, they are cost-effective. These devices aid patients who require continuous medicine administration over an extended length of time.

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