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Matrix Tablet: An Overview

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ABSTRACT: There the various routes of drug delivery oral route is most preferredroute.Butconventionaldosageformoffersfewlimitationswhichcouldbe resolved by modifyingtheexistingdosage form. Sustained release drug delivery system helps in maintaince of constantplasma drug concentration and retards the release rate of drug therebyextendingthedurationofaction.Therearevariousformulationstrategiesfor sustained release tablets among which matrix tablet serves as animportanttool.Hencetheproblemlikepoorpatientcompliance,multipledosing, see-saw fluctuations can be easily minimized. Matrix tablets canbeformulatedbyeitherdirectcompressionorwetgranulationmethodbyusingavarietyofhydrophilicorhydrophobicpolymers.Therateofdrugreleasefromthematrixisprimarilygovernedbyrateandextentofwaterpenetration,swellingofpolymer,dissolutionanddiffusionofdrug.Thus,sustained release matrix tablet can offer better patient compliance andcouldbequitehelpfulintreatmentofchronicdiseases.Thepresentarticleconcentrates on oral sustained release tablets with a special emphasis onmatrix tablet.

Keywords Matrix tablet, Polymer, Sustained release.

I. INTRODUCTION

Oral drug administration is the most preferable and oldest route for drug delivery. This is due to the low cost of medicine preparation and ease of administration, which makes it the most favorable route of drug administration for patients [1, 2]. It has been known as the most popular and successful route for controlled delivery of fast release drugs because of greater flexibility in the designing of dosage forms compared to other routes [3]. Previous reviews reported that more than 50% of the medications which are available in the market were found to be given orally [4, 5].

Research on oral drug delivery with either further development in the delivery system or novelty in the drug formulation is ongoing work for many formulation scientists [6]. The most prominent requirements for a drug delivery system to make it novel are, first to deliver a drug at a controlled rate, and second to pass the active entity to the target site for action. Formulation scientists have been used many possible approaches to achieve this challenging novelty in oral drug formulation, either by unifying drug distribution into a carrier system, or by controlling drug release in the blood to reach the designed plasma drug concentration-time profile [7, 8].

Controlled release drug delivery systems can offer temporal and/or locative control over the release of drugs. Thus, the oral controlled release drug delivery system is the most widely used system for controlling the release of drugs given orally [9]. Many advantages for this system were reported, such as preventing plasma drug level fluctuations, reducing dosing frequency of drug administration, enhancing drug bioavailability, improving patient compliance and minimizing side effects and toxicity of drugs [10]. In comparison, the conventional oral drug dosage form has a number of shortcomings such as, high tendency of plasma drug level fluctuations, increasing the dosing frequency of drug administration, time limitation for drug electiveness at the target site of action and low oral bioavailability of some drugs due to interaction with food or unsuitable gut environment, for example cefotaxime Na [11].

Matrix system

The matrix system is the most commonly used controlled release delivery system of rapidly released drugs. The drug is uniformly dissolved or dispersed in suitable polymeric materials. Most of thesematerials have either hydrophilic or hydrophobic properties, in which the retardant material and drug are homogeneously distributed or dissolved in the polymeric matrix. This is done either by wet granulation or by the direct compression technique in the solid dosage form, where the drug is embedded in the matrix core of the retardant . Therefore, this matrix system is characterized by drug dispersed materials in the polymer blend Drug release is controlled by

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gradual dissolution of the matrix or gradual leaching of the drug from the retardant material[12].

A range of controlled release mechanisms have been explained, including diffusion through matrices or across membranes and erosion. However, knowing the material properties of the matrices is essential to predict the mechanism of drug release. The matrix system of oral controlled release delivery system of drugs is classified according to polymer type, porosity sizes and other miscellaneous ways of matrix preparation[13].

Advantages of matrix system

- Easy to manufacture.
- Costeffective.
- Improved patient compliance.
- Sustainedreleaseformulationsavoidthehigh blood concentration.
- Reducedrugtoxicitybyslowingdowndrugabsorption.
- EnhanceddrugstabilityinGImilieu.
- Minimizethelocalandsystemicsideeffects.
- Nosee-sawfluctuationsinplasmadrugconcentrationprofile.
- Less amount of drug is required[14].
- Temporaleffectscanbeprovided.e.g.morning relief of arthritis through bed timedosing.

Disadvantagesofmatrixtablets

- Matrixneedstoberemovedafterdrug release.
- Costly in comparison to conventionaldosage form. Presenceoffoodandguttransitiontimecanaffectthereleaserate[14].

Classification of Matrix Tablets

Hydrophobic matrices (plastic matrices)

In this technique hydrophobic inert polymer are used as release retarding matrix material. The drug is mixed with the hydrophobic inert polymer (e.g. polyethylene, poly vinyl chloride, ethyl cellulose) and then compressed into tablet. The drug is entrapped between the network channels of polymer particles thereby sustaining the release of drug[11,12].

Lipid matrices

Lipid material is used as release retardant (e.g. carnauba wax in combination with stearyl alcohol).

Mechanism involved in drug release includes both pore diffusion and matrix erosion[11,12].

Hydrophilic matrices

In this type of system a variety of hydrophilic polymers can be used, such systems are also known swellable matrices. These polymers are more preferred than former ones as they are cost effective and a desirable drug profile can be easily obtained[11,12].

Classification of hydrophilic polymer matrices

- Cellulose derivatives: Methyl cellulose 400 and 4000cPs; Hydroxy ethyl cellulose, Hydroxy propyl methyl cellulose (HPMC) 25, 100, 4000 and 15000cPs and Sodium carboxy methyl cellulose.
- Non cellulose natural and semi-synthetic polymers: Agar-Agar; alginates; carob gum; molasses; polysaccharides of galactose and mannose; chitosan and modified starches.

•Polymer of acrylic acid: carbopol-934[11,12].

Biodegradablepolymers

Theseconsistofbiodegradablepolymersthat are degraded either by enzymatic or nonenzymatic process into by products which areexcreted out from the body e.g. Polyanhydrides,proteins, polysaccharides.

Mineral matrices: Species of sea weeds likealginicacidareusedasreleaseretardants.

Mechanism of drug release

The mechanism involved in drug release includes either diffusion or dissolution. On exposure with aqueous solution hydration of matrix takes place as a result it swells to block up existing pores, dissolution of the contents takes place. Due to gel formation a viscous solution is formed which give rise to a positive pressure which opposes the liquid entry and causes the disintegration of matrix. The swelling of the matrix and consequent drug release by diffusion from the matrix and erosion of the matrix is as shown in [11,12].

Evaluation of Oral Sustained Release Tablets

Thickness of tablet

Thickness of tablet is evaluated by using micrometer screw gauge. Test is carried out randomly on twenty tablets and average values are calculated[15,16].

Hardness of tablet

Hardness of tablet of each batch is evaluated by monsantto hardness tester and average values are calculated[15,16].

Uniformity of weight

20 tablets are selected randomly and weighed individually and collectively; average

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weight is calculated of weight variation=(Individual Weight- Average weight/Average Weight) × 100

Uniformity of content: This test is done to make sure that every tablet should contain the same amount of active ingredient with little or no variation within a batch. For content uniformity test 30 tablets are selected and 10 are assayed individually. At least 9 must assay between ±15% of the declared potency and should not exceed ±25%

Friability

20 tablets are weighed and placed in fribilator. The chamber is rotated for 4 minutes at a speed of 25 r.p.m. the tablets are removed from the chamber and weighed again. Loss in weight indicates friability. The tablets to be considerd of good quality if loss in weight is less than 0.8%[15,16].

In vitro dissolution studies

The test is carried out to measure the amount of time required for certain percentage of drug to go into the solution under the specific test conditions. Rotating paddle type and rotating basket type apparatus can be used as per pharmacopoeial standards or as mentioned in monograph of particular drug[15].

The test is passed if for each of the five tablets, the amount of active ingredient in solution is not less than 70% of the stated amount or as specified in the monograph of the API in pharmacopoeia[15,16].

II. DISCUSSION

The present article is focused on sustained release matrix tablet. The goal of sustained release could be easily and effectively ascertained via approach of matrix tablets. As compared to conventional counterparts matrix tablets offer better patient compliance, maintains constant plasma drug concentration level, reduces chances of toxicity and once a day drug therapy reduces overall cost of treatment. Maintenance of drug concentration within therapeutic range is helpful in minimizing irrational use of drugs as well as helpful in the treatment of chronic diseases.

III. CONCLUSION

It is concluded that, Oral Sustained Release tablets provide the drug release in a modified form than their counterparts. It is an effective to ascertain the therapeutic goals with maximum patient compliance. However, accurate adjustment of various physicochemical parameters is necessary. Matrix tablet is helpful in overcoming the problems associated with conventional dosage form.

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