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Sustain Release Matrix Tablet: Overview

Padmaja K. Mhaske*[1], Nilesh R. Bhosale[2], Pavan P. Kondewad[3], Savita N. Rathod[4]

[1,3] M Pharm, Department of Pharmaceutics, PDEA's Seth Govind Raghunath Sable College of Pharmacy, Purandhar (Saswad), Pune, Maharashtra 412301 India
[2]Assistant of Professor Department of Pharmaceutics, PDEA's Seth Govind Raghunath Sable College of Pharmacy, Purandhar (Saswad), Pune, Maharashtra 412301 India
[4]M Pharm, Department of Pharmaceutics,Vilasrao Deshmukh Foundation group of institutions (VDF school of pharmacy Latur) latur

ABSTRACT

Formulations for sustained medication release are very useful in the treatment of chronic disorders. The most likely oral sustained drug release dosage type has been matrix tablets. The mechanism of action of matrix tablets is to maintain a consistent plasma drug concentration, sustain the rate of drug release throughout time, and create therapeutic action for an extended length of time. In formulations with a short half-life and high dosage frequency, extended release is crucial. The matrix regulates how quickly the medication is released. Retardants including polyglycolic acid, polymethyl methacrylate, and hydroxypropyl methyl cellulose (HPMC) are utilised. The retardant's matrix core contains the medication contained within it. The matrices employed could be mineral-based, hydrophobic, or biodegradable. Drug release is regulated in matrix tablets that can be made using wet granulation or direct compression techniques by using several kinds of polymers. Drug release in matrix tablets is regulated by both diffusion-controlled and dissolution-controlled mechanisms. By lowering the frequency of drug administration, matrix tablets increase patient compliance and result in higher therapeutic efficacy.

Key Words: ***Sustained release oral dosage form, Matrix tablet, Classifaction, Methods.***

INTRODUCTION

The oral route is the most common method for drug administration, in part because it is simple to administer and because gastrointestinal physiology allows for more design freedom in dosage forms than most other routes[1]. When referring to drug delivery systems that are intended to achieve or prolong therapeutic effect by continuously releasing medication over an extended period of time after administration of a single dose, the terms sustained release, prolonged release, modified release, extended release, or depot formulations are used.[2].

The benefits of giving a medicine that releases slowly over time in a single dose as opposed to several doses have long been understood by the pharmaceutical industry. Better patient compliance and increased clinical efficacy of the medicine for its intended purpose are frequently associated with the goal to maintain a nearly constant or uniform blood level of a drug[3]. The development of continuous or controlled release medication delivery has received more attention due to the increased complexity and expense involved in launching novel pharmacological entities.

For sustained release, the matrix system is frequently utilised. The medicine that is dissolved or distributed is released over a longer period of time and under control by the release system. In actuality, the term "matrix" refers to a well combined mixture of one or more medications and a gelling agent, such as hydrophilic polymers [5]. An extended release dosage form's principal objective is to keep therapeutic medication levels in the bloodstream for a long time.

Reasons for Creating Sustain release DDS[15,19]
A decrease in the number of trucks.

Reduced toxicity; enhanced action of a drug with a shorter half-life; stabilization of drug concentration at the plasma level

Sustained Release Oral Dosage Forms:
Not all medications are appropriate for formulation into sustained release medicines, and not all medical situations call for the use of such a product. Sustained Release Oral Dosage Forms. When deciding whether or not to produce a sustained release dosage form, the medicine and the therapeutic indication must be taken into account together.

Principle of Sustained Release Drug Delivery Systems[5,8,9]
The typical dose forms release the active components into an absorption pool. Absorption pool refers to the medication solution at the site of absorption. The first order rate constants for drug absorption, release, and elimination are Ke, Kr, and Ka. Drug release is immediate in standard dose forms, demonstrating that Kr>>>>Ka. However, Kr Ka for non-immediate release dosage forms, meaning that the release of drug dose forms is the rate-limiting phase. It is evident that zero order kinetics exists, as the equation demonstrates.

Kr°= Rate In = Rate Out = KeCd Vd
Where, K: Zero-order rate constant for drug release- r°Amount/time, K : First-order rate constant for overall e drug elimination-time, C: Desired drug level in the d body – Amount/volume, and V: Volume space in d 4 which the drug is distributed in litre.

Designing Sustained-Release Drug Delivery System
The majority of orally delivered medications are designed to permeate the general circulation and perfuse to different bodily tissues; targeting is generally not a major problem. Because of this, sustained release techniques are typically used.

It is believed that raising the concentration at the absorption site will raise blood levels in circulation, which will then encourage a higher concentration of the medication at the site of action. Therapeutic dosage can therefore be increased if toxicity is not a problem. Essentially, the release of a medication from a dosage form, penetration through the biological environment, and absorption via an epithelial membrane into the blood are what various delivery systems rely on most frequently. The design of such a System is influenced by a wide range of physicochemical and biological factors[38]

Factors Considered In Dosage Form Design[7,11,12]
There are mainly 2 kinds of factors that effect the dosage form design. They are divided into:

1.Biological Factors
a. First pass effect: Drugs that experience a significant first pass effect have a slower release rate. The bioavailability is impacted by the delayed release rate.

b. Half-life: A drug's half-life is a measurement of how long it stays in the body. In the dose form, a prohibitively high concentration of the drug may be present if the medication has a short half-life (less than 2 hours). Contrarily, a medication with a half-life of removal of at least eight hours is effectively maintained in the body when given in conventional doses and by continuous drug delivery systems.

c. Negative side effects: Extending the drug release may result in unfavourable negative side effects.

d. Absorption and solubility: These two concepts are connected. Including medications that aren't very water soluble can reduce absorption effectiveness overall.

2.Physiochemical Factors
a. Drug stability: The loss of medication in the GI tract due to acid hydrolysis and/or metabolism is a crucial concern in oral dose formulations. Drugs degrade in solid states much more slowly than they do in suspended or solution states. The most effective control unit would be one that activates its material only in the intestines; this would considerably increase the relative bioavailability of a medicine that is harmful in the stomach.

b. A medicine needs to be absorbed, dissolved in the aqueous phase close to the site of delivery, and then partitioned into the absorbing membrane. This is known as aqueous solubility and PKA. The water solubility and, if it is soft acid, the pKa of a drug are two of the most significant physicochemical characteristics that influence its absorption activities. Controlled release techniques are successful because of these characteristics. Drugs with high aqueous solubility degrade slowly and frequently experience problems with oral bioavailability.

c. The partition coefficient measures how much of the medication is in the aqueous phase compared to the oil phase. Because they won't partition out of the lipid membrane once they enter it, drugs with greater partition co-efficients are not suited for oral SRDDS. It can be determined using the formula.

K= Co / Cw

Co = Equilibrium concentration in organic phase
Cw= Equilibrium concentration in aqueous phase

d. Diffusivity and molecule size: The size and shape of the membrane cavitie affect the diffusivity. The flexible polymer array contributes to the 100–400 Daltons, or 10–6–10–9 cm2/sec, intermediate molecular weight drug diffusion coefficient. For medications with molecular weights greater than 500 Daltons, many polymers have very low diffusion coefficients, or less than 10–12 cm2/sec. Drugs that are challenging to regulate drug release level from dosage form include proteins and peptides.

Matrix Tablet
Active and inactive components are uniformly combined and disseminated in the dosage form to create a matrix system. The popularity of the matrix systems can be ascribed to a number of variables, and it is unquestionably the most widely utilised oral prolonged release technology. Fick's first law of diffusion governs the release from matrix-type formulations.

In a matrix system, the drug is dispersed as solid particles inside a porous matrix made of either a hydrophobic polymer (like wax, polyethylene, polypropylene, and ethyl cellulose) or a hydrophilic polymer (like alginates, scleroglucan, hydroxy propyl cellulose, and sodium carboxy methylcellulose). In this context, "matrix" refers to the three-dimensional network that houses the drug as well as other compounds such solvents as well as any excipients needed for the particular recipe. The medicine is continuously released via matrix drug delivery devices. These release the medication using diffusion- and dissolution-controlled processes, respectively. At first, drug particles on the release unit's surface will disintegrate, causing the medication to be released quickly.

The drug particles will then disintegrate and diffuse through the pores of the release unit to the outside at gradually greater distances from the surface of the release unit. This technique creates the drug reservoir by uniformly dispersing drug particles in a matrix of rate-regulating polymers made of either hydrophilic or lipophilic polymers.
The drug is mixed with the polymer at a high temperature, or a therapeutic dose of finely ground drug particles are blended with a liquid polymer or a highly viscous base polymer, followed by cross-linking of the polymer chain. The medicine and the polymer can also be dissolved in a common solvent, and then the solvent is evaporated at a high temperature or under a vacuum to create the substance. This polymer matrix diffusion-controlled drug delivery system's rate of drug release is time-dependent and is and is characterised at steady state by

Q/t1/2 = (2ACRDp)1/2

Where,
A is the initial loading drug dose in the polymer matrix;
CR is the drug reservoir concentration in the system;
Dp is the diffusivity of the drug molecules in the polymer matrix.
Drug release is controlled by controlling the loading dose, polymer solubility of drug and its diffusivity in the polymer matrix and the porosity of the release unit. [13]

Matrix System
For sustained release formulations, matrix systems, also known as diffusion controlled systems, are quite common (Colombo et al. 2000). The can be separated into several different categories of mechanisms, including reservoir matrix systems, monolithic matrix systems, and osmotic pump systems, through which they delay the release of the medication.[4]

Benefits of the Matrix Tablet[2,3]

• It's simple to make.
• It's flexible, efficient, and affordable. can be made to release molecules with a high molecular weight.
• The longer therapeutic concentrations may be maintained by the sustained release formulations.
• Using formulations with a sustained release helps prevent excessive blood concentration.
• Formulations with sustained release may increase patient compliance.
• Decrease toxicity by delaying the absorption of the medication.
• Boost the drug's stability by shielding it from the gastrointestinal tract's hydrolysis or other derivative modifications.
• Reduce any negative local and systemic consequences.
• An increase in therapeutic effectiveness.
• Reduce drug buildup with chronic dosage.
• Less overall drug use.
• Increasing some medications' bioavailability.
• An increase in the capacity to deliver extraordinary effects.

Ex: Morning pain alleviation from arthritic medication taken at night

Matrix Tablet Drawbacks [2–3]
After the medicine has been released, the residual matrix must be removed.
• Expensive preparation.
• A number of variables, including diet and the rate of intestinal transit, influence the release rates.
• The square root of time affects how quickly drugs are released. Due to a rise in diffusional resistance and/or a fall in effective area at the diffusion front, release rate continuously decreases. However, using extremely slow release rates—which in many cases are identical to zero-order—can result in a significant persistent effect.

Matrix Tablet Formulation Requirements[11,14,15]
The following medications have the ideal physicochemical and pharmacokinetic properties to be manufactured into extended release tablets:
• The molecular weight should be under 1000 Dalton.
• For pH 1 to pH 7.8, aqueous solubility should be more than 0.1 mg/ml.
• A high partition coefficient is ideal.
• Diffusion should be the route of absorption, and pH and enzymes should not have an impact on the general absorbability from all GI segments release.
• The elimination half-life need to be 2 to 8 hours.
• Drugs shouldn't be metabolised before being absorbed because this reduces their bioavailability.
• A minimum of 75% absolute bioavailability is required.
• The release rate should be larger than the absorption rate constant (Ka).
• The apparent volume of dispersion (Vd) needs to be significant.

Classification of Matrix Tablets[10,17]
Matrix tablets can be classified as;

On the basis of retardant materials used :
Under this category the matrix tablets are further divided into 5 types:
Hydrophobic matrices (plastic matrices)
Lipid matrices
Hydrophilic matrices
Bio-degradable matrices
Mineral matrices.

On the basis of porosity of matrix:
Macroporous systems
Microporous systems
Non-porous systems.

On The Basis Of Retardant Material Used
a)Plastic matrices or hydrophobic matrices:
Inert, hydrophobic materials were used in 1959 to create the first plastic matrices. In this procedure, the medication was first combined with a hydrophobic polymer before being compacted into a tablet. The medicine is dispersed by diffusion through a network of channels that connects tightly packed powder particles. As a result, sustained release is generated. Polyethene, poly-vinyl chloride, and acrylate polymers, along with their co-polymers, are used to create the hydrophobic matrices. Due to the water and digestive fluids included, these matrix pills are inert by nature. Diffusion is how these matrix tablets work, and the rate-limiting stage is liquid penetration.

b) Lipid matrices:
These matrices are created by using lipid waxes. These matrices allow the medication to be delivered by pore diffusion and erosion. Compared to entirely insoluble polymer matrix, the sustained release via these matrices is more sensitive to the makeup of the digestive fluid. Most sustained release formulations use a retardant base made of carnauba wax, stearyl alcohol, and stearic acid.

c) Hydrophillic matrices :
A hydrophilic polymer (gelling agent) is used to correctly mix a composite of one or more medications, which is referred to as a matrix. Because it is successful at producing a desired drug release profile, is inexpensive, and has widespread regulatory acceptance, the hydrophillc polymer matrix is frequently employed in oral controlled drug delivery. Based on the types of polymers utilised, these matrices are further categorised into three classes;

Cellulose derivatives
Methylcellulose 400 and 4000cps, hydroxypropylmethyl cellulose (HPMC) 25, 100, 4000, and 15000cps, hydroxyethyl cellulose, and sodium carboxymethyl cellulose are the polymers employed in the formulation.

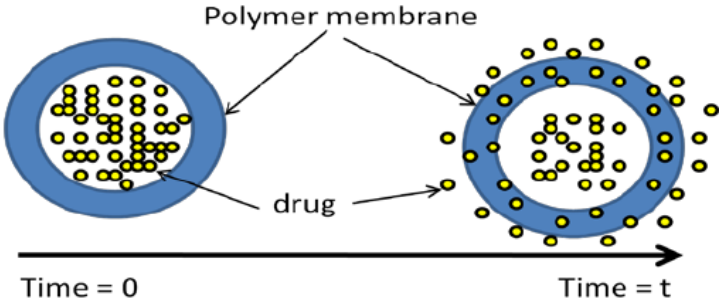
Non-cellulose natural/semi—synthetic polymers
Acrylic acid polymers: Carbopol-934 is the most frequently used polymer in this group. Agar-agar, alginates, carob gum, molasses, polysaccharides containing galactose and mannose, chitosan, and modified starches are examples of other polymers.

Biodegradable Matrices :
Biodegradable matrices contain polymers that are connected to one another by functional groups with an unstable linkage in their backbones. These matrices deteriorate biologically as a result of the enzymes produced by the nearby living cell. By metabolising the oligomers and monomers, the breakdown may take place through a non-enzymatic process. Proteins and polysaccharides are examples of natural polymers. It also includes a few natural polymers that have been modified. Aliphatic polyesters and poly anhydrides are examples of artificial polymers.

Mineral matrices

Polymers derived from various seaweed species are present in mineral matrices. Mineral matrices include hydrophilic carbohydrates like alginic acid, which can be produced from some types of brown seaweed using diluted alkali.

On The Basis Of Porosity Of Matrix
In this the drug molecules diffuse across the matrix and produce sustained release.



Three different categories are added to the matrix.

a) Systems with large pores
This type of matrix has pores that are between 0.1 and 1 m in size, which is greater than diffusant molecule size. Through these pores, the medication permeates this type of system.

b) Systems with tiny pores
Drug molecules pass through pores with diameters ranging from 50 to 200 nm.

c) Systems without pores
No pores exist in these systems. Molecular diffusion takes place through network meshes. Whereas the polymeric phase is present, there is no pore phase.

Method Of Preparation Of Matrix Tablet
1) The Wet Granulation Method
Milling and gravity mixing of the excipients, polymer, and medication.
Making the binder solution
Screening of the wet mass after wet massing with the addition of a binder solution or granulating solvent.
The wet grains are dried.
Dry granules are screened before being mixed with lubricant and disintegrants to create "running powder" and compressed into tablets.

2) The Dry Granulation Method
Compression into slugs or roll compaction Milling
Screening of slugs and compacted powder
Mixing with lubricant and disintegrants Compression of tablet.
Milling and gravitational mixing of medication, polymer, and excipients.

Release-Limiting Factor Effect on Drug Release [20,21]
The regulated release of pharmaceuticals from either capsules, matrices, or sandwich-type drug delivery systems is mechanistically analysed to show that partition coefficient, diffusivity, diffusional path thickness, and other system characteristics play distinct rate-determining roles.

Polymer hydration: It's crucial to research the swelling and hydration of as many different types of polymers as possible. The more crucial step in polymer dissolution includes water absorption and adsorption in more practical JPSBR: November/December 2011 (143–151), Volume 1, Issue 3. Patel H. et al. 147 locations, breakage of polymer-polymer linking with the concurrent formation of water-polymer connecting, separation of polymeric chains, swelling, and ultimately dispersion of polymeric chain in dissolving medium.

Drug solubility: Drug molecular size and water solubility are key factors in determining how successfully drugs are released from polymeric matrices that are controlled for swelling and erosion. For medications with enough water solubility, drug release occurs by dissolving in an infiltrating media, and for medications with inadequate solubility, release occurs via both drug and drug particle dissolution by erosion of the matrix tablet.

Solution solubility: Given that hem perfusion actively maintains the in vivo (biological) sink condition, it makes sense that all in vitro drug release experiments be carried out in this ideal sink environment as well. This will allow for a more accurate simulation and correlation between the in vitro drug release profile and the in vivo medication administration. In order to prevent the solubility factor from interfering with or complicating the release of the medicine, a sink state must be maintained.

Polymer diffusivity: The diffusion of small molecules in polymer structures is an energy-activated process in which the diffusant molecules move to a series of equilibrium positions after acquiring enough activation energy for diffusion Ed. This process is dependent on the length of the polymer chain segment, cross-linking, and crystallinity of the polymer. The three variables—polymer particle size, viscosity, and concentration—can each be linked to the release of a medication.

Polymer particle size: When the concentration of hydroxyl propyl methylcellulose is higher, the impact of particle size on the rate at which propranolol hydrochloride is released is less significant; conversely, when the concentration of polymer is lower, the significance of this variable is greater. Additionally, he explained these findings by noting that the burst release was caused in some parts of the matrix by low quantities of hydroxypropyl methylcellulose.
Viscosity of the polymer is utilised to calculate the weight of the matrix in cellulose ether polymers. The gel layer becomes more viscous when the matrix formulation's polymer's molecular weight or viscosity is increased, which slows the dissolving of the medicine.

Polymer concentration: A higher polymer concentration results in a gel with a higher viscosity and a gel layer with a longer diffusional path. As a result, the medication's effective diffusion coefficient may drop, resulting in less drug release. As the concentration of polymer rises, the method of drug release from matrix similarly switches from erosion to diffusion.

Thickness of polymer diffusional path: Fick's law of diffusion essentially governs the regulated release of a drug from both capsule- and matrix-type polymeric drug delivery systems.

$$JD = dc/dx$$

where
JD is the flow of diffusion across a unit-area plane surface.
D is the drug's diffusibility, and dc/dx is the drug's concentration gradient along a diffusion path with thickness dx.
Hydrodynamic diffusion layer thickness: It has been found that changes in the hydrodynamic diffusion layer thickness on the surface of matrix-type delivery devices affect the drug release profile. As the hydrodynamic diffusion layer's thickness is increased, the magnitude of drug release value drops.

Medication loading dose: Drug solubility and subsequent release kinetics are both significantly influenced by the loading dose of the medication. In the case of medications that are poorly water soluble, the impact of initial drug loading on the tablet's resulting release kinetics is more complicated; as initial drug loading increases, the relative release rate initially declines and then increases, whilst the absolute release rate increases monotonically. The porosity of the matrix after drug depletion rises with increasing initial drug loading in the case of readily water soluble medicines. A higher absolute drug transfer rate results from this impact. But another phenomenon must be considered in the case of medications that are weakly water soluble. The surplus drug must be regarded as non-dissolved and thus not available for diffusion when the amount of drug present at a specific site within the matrix exceeds the amount of drug soluble under given conditions. The amount of solid medication that remains in the tablet increases as the initial drug loading of weakly water soluble medicines is increased.

Surface area and volume: It is widely established, both theoretically and experimentally, that the rate of drug release is influenced by the device's surface area. It has been found that the surface area of the dosage form affects the drug release rate both in vitro and in vivo. According to Siepman et al., smaller cylindrical tablets release faster than larger ones.

Effect of the diluent: The type of diluent determines whether it acts as a diluent or a filler. While insoluble diluents like dicalcium phosphate lower the Fickian diffusion and increase the relaxation (erosion) rate of the matrix, water soluble diluents like lactose significantly boost drug release rate and shift the release mechanism towards it. The cause of this is because water-soluble fillers in matrices encourage water penetration into the interior of the matrix because of an increase in hydrophilicity of the system, which causes rapid drug diffusion and an increase in drug release rate.

Additives: It has been suggested that adding non-polymeric excipients to a polymeric matrix will increase the pace at which hydrosoluble active ingredients are released into the environment. These increases in release rate would be noticeable if the excipients are soluble, like lactose, and less significant, like tricalcium phosphate, if they are insoluble.

Biological Factors Influencing Release From Matrix Tablet [20,21].
Biological half-life.
Absorption.
Metabolism
Distribution
Protein binding
Margin of safety

Biological half-life- An oral SR product's primary objective is typically to sustain therapeutic blood levels over an extended period of time. Drugs must enter the circulation at a rate that is about equal to their rate of elimination in order to do this. The half-life (t1/2) provides a numerical description of the elimination rate. Each drug has a unique characteristic elimination rate, which is the total of all processes that permanently remove the drug from the bloodstream, including metabolism, urine excretion, and all other processes. Short-half-life therapeutic substances are typically a great candidate for SR formulation since it can lower dose frequency. Levodopa and furosemide are examples of medications with a half-life less than two hours that make them poor candidates for SR preparation. Since their effects are already sustained, compounds having half-lives longer than 8 hours are likewise often not employed in sustaining form. Examples include phenytoin and digoxin.

Absorption: Since the purpose of forming a SR product is to place control on the delivery system, it is necessary that the rate of release is much slower than the rate of absorption. If we assume that the transit time of most drugs in the absorptive areas of the GI tract is about 8-12 hours, the maximum half- life for absorption should be approximately 3-4 hours; otherwise, the device will pass out of the potential absorptive regions before drug release is complete. Thus corresponds to a minimum apparent absorption rate constant of 0.17-0.23h-1 to give 80-95% over this time period. Hence, it assumes that the absorption of the drug should occur at a relatively uniform rate over the entire length of small intestine. For many compounds this is not true. If a drug is absorbed by active transport or transport is limited to a specific region of intestine, SR preparation may be disadvantageous to absorption. One method to provide sustaining mechanisms of delivery for compounds tries to maintain them within the stomach. This allows slow release of the drug, which then travels to the absorptive site. These methods have been developed as a consequence of the observation that co-administration results in sustaining effect. One such attempt is to formulate low density pellet or capsule. Another approach is that of bio adhesive materials.

Table 1: List of drugs formulated using different polymer and method DRUGS USED CATEGORY METHOD USED POLYMER USED

Zidovudine	Anti-viral	Direct Compression	HPMC-K4M, Carbopol-934
Venlafexine	Anti-depressant	Wet Granulation	Beeswax, Caranuaba wax
Domperidone	Anti-emetic	Wet Granulation	HPMC-K4M, Carbopol-934
Alfuzosin	Alfa-adrenergic Agonist	Direct Compression	HPMC-K15M, Eudragit
Minocycline	Antibiotic	Wet Granulation	HPMC-K4M, K15M, EC
Ibuprofen	Anti-inflammatory	Wet Granulation	EC, CAP
Metformine HCL	Anti-diabetic	Direct Compression	HPMC-K100M, EC Propranolol
HCL	Beta-adrenergic blocker	Wet Granulation	Locust bean gum, HPMC
Furosemide	Anti-diuretic	Direct Compression	Guar gum, Pectin, Xanthan
gum			
Acarbose	Anti-diabetic	Direct Compression	HPMC, Eudragit
Aceclofenac	Anti-inflammatory	Wet Granulation	HPMC-K4M,K15M,

K100M,E15,EC, Guar gum			
Ambroxol HCL	Expectorant, Mucolytic	Direct Compression	HPMC-K100M,
Aspirin	Anti-inflammatory	Direct Compression	EC, Eudragit-RS100, S100
Diclofenac Na	Anti-inflammatory	Wet Granulation	Chitoson, EC, HPMCP, HPMC
Diethylcarbamaz epine citrate	Anti-filarial	Wet Granulation	Guar gum, HPMC-E15LV
Diltiazem	Ca+2 channel blocker	Direct Compression	HPMC-K100M, K4M, Karaya gum, Locust bean gum, Sod.CMC
Enalpril meleate	ACE inhibitor	Direct Compression	HPMC-K100M, K4M, Flutamide
	Anti-androgen	Direct Compression	HPMC-K4M, Sod.CMC, Guar gum, Xanthan gum
Indomethacin	Anti-inflammatory	Direct Compression	EC, HPMC
Chlorphenarimin e meleate	H1 antagonist	Melt-extrusion	
Losartan potassium		Anti-Hypertensive Direct Compression	Xanthan gum, Chitoson HPMC-K100M, K4M, EC
Metoclopromide	Anti-emetic	Direct Compression	HPMC-K100M, K4M, Eudragit
Naproxen	Morphine antagonist	Direct Compression / Wet Granulation	HPMC, CMC, EC, SSG

Metabolism : Drugs that are considerably metabolised in the intestine's tissue or lumen prior to absorption may have decreased bioavailability when taken in slower-releasing dose forms. As a result, the criterion for the medicine to be created Drug's half-life for the sustained-release dose form should be less than five hours.

The medication must be completely soluble in water.
A drug's therapeutic window ought to be wider.
The GIT should absorb the drug completely.

The medicine to be formulated as a matrix tablet with polymer is shown in the above table, along with the procedure utilised to prepare it.A medicine can be produced in SR dose form even if it has poor water solubility. To do this, the drug's solubility must be enhanced using the appropriate method before being synthesised in the SR dosage form. But at this time, it is important to avoid drug crystallisation, which occurs as the drug enters the systemic circulation, and to take precautions to avoid it.

Distribution: Drugs with a high apparent volume of distribution, which affects the drug's rate of elimination, are not good candidates for oral SR drug delivery systems, such as chloroquine.

Protein Binding: All drugs are to some extent bound to plasma and/or tissue proteins, and the pharmacological response to a medication is dependent on the drug's unbound concentration rather than its total concentration. No of the dosage form, the drug's protein binding has a substantial impact on its therapeutic effect since it increases plasma concentration. For this kind of medicine, an SR drug delivery method is not always necessary because of biological half-life.

Margin of safety: As we are aware, the safer a drug is, the higher the therapeutic index number. Due to technological restrictions on control over release rates, drugs with lower therapeutic indices are typically poor candidates for formulation of an oral SR drug delivery system

CONCLUSION

The before mentioned discussion makes it clear that sustained-release formulations are beneficial for boosting dose effectiveness and for increasing patient compatibility. Furthermore, all of these are reasonably priced. When it comes to antibiotics, where inappropriate usage of the drug could lead to resistance, the dosage form is simple to optimize and very beneficial.

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