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A Concise Review: Sustained Release Tablets

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ABSTRACT

Sustained release Tablets describes a pharmaceutical dosage form formulated to retard the release of therapeutic drug so that it remains in the systems. Once dose reaches maximum level, the concentration of the medicine in the body releases slowly, so that it takes a long time to fall below the therapeutic range.Improving patient compliance, while increasing bioavailability and effectiveness, is a fundamental concept of the SDDS..It works on various mechanisms to control drug emission rate

Keywords: *Sustained release, tablets, matrix, plasma concentration*

1. INTRODUCTION

What is the meaning of sustained release drug delivery system?" To allow the medicine to be delivered at a given estimation and maintained level of medicine for a defined duration with the least possible adverse event, sustained dosage forms are used.[1] Maintaining the regimen plasma level for a prolonged duration is a major objective of sustained release form and, in general, it can be achieved by obtaining 0° (zero degree) release through medicinal product.[2]

FLAWS OF CONVENTIONAL DOSAGE FORMS[3]

1.There is a danger of missing a dose when medication has a less 1/2-life and needs to be subsequently taken .

2. When drug is infrequently taken, plasma peak trough conc^{n} v/s time profile is not stable.

3.Fluctuations in plasma drug levels during conventional dosage forms can result in under or over doses.

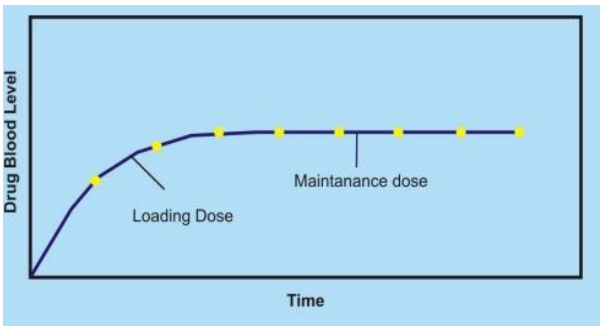

Figure 1 : Plasma conc.v/s time graph

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ADVANTAGES OF SDDS:[4]

1. Reduced fluctuations.
2. Dose decreases.
3. Patient compliance.

DISADVANTAGES OF SDDS:[5]

1. Chances of dose dumping.
2. Highly expensive.

THEORY OF SUSTAINED RELEASE:[6,7]

There are two doses needed in Sustained release dosage:

- Loading dose
- Maintenance dose

A loading available dose reaches therapeutic levels quickly after administration, while a maintenance dose or slowly availabledose releases the drug slow and maintains therapeutic levels for a long time.The maintenance dose of the drug release should be in the order of zero (regardless of concentration) so that the drug is continuously available at the site of absorption

APPROACHES USED FOR SUSTAINED RELEASE TABLETS

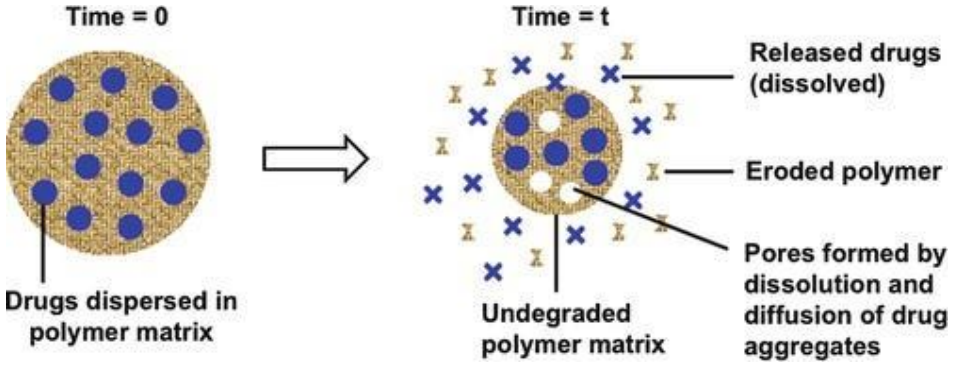

Figure 2: Matrix SR

1. Dissolution systems
2. Diffusion systems
3. Ion complexes
4. pH formulation
5. Altered density

1. Diffusion systems[8]

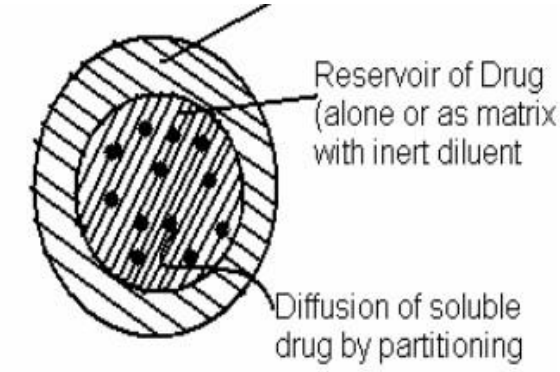

Figure 3: Reservoir SR

It is based on Fick's law·

J= - Ddc / dxL

It is of 2 types-

- Reservoir types
- Matrix types

2. Dissolution system[9]

SR production is done by decreasing their disso rate.Rate-regulating coatings, pulse transmission can be achieved with polymers.Waxes controlling the drug release speed by modifying the tablet's porosity, reducing its wettability.

3. Ion exchange resins[10]

Polymers are made up of functional groups that form salt at repeated chain. The drug is exchanged with appropriate charged ions resin.

Advantages- it is best suited for medicinal products which are degraded by enzymatic process.

4. pH independent formulations[11]

The systems are created for drugs that are sensitive to acid or drugs that can irritate the gastrointestinal mucosa, with the goal of delivering them to the intestines. The coating on the membrane prevents the dissolving in the stomach's, creating a porous membrane.

5. Altered density [12]

It is of two types-

5.1) High' density method

Thee density of gastrointestinal fluid is approximately 1.4 grams per cubic centimeter, so drug particles with a density higher than that of GI fluid are utilized.

5.2) Low density method

The density of pellets is < GI fluids, causing them to float in gastric juices for a prolonged duration. For instance, a drug containing a hydrogel like HPMC swells and its density decreases to less than 1.

CRITERIA THAT THE DRUG MUST MEET ARE[13]

a) Desireable half-life

Acceptable half life 3-4 hrs.

b) High Therapeutic index

A drug is relatively safe when TI more than 10.

c) Small dose

Small size dose best suited.The maximum recommended dose for extended-release medications is 0.5-1g.

d) Desirable absorption window

Some oral medications get absorbed mainly in a certain part of the GIT e.g. fluorouracil, thiazide. Drug's absorption rate should get faster than the rate at which it is released.

e) 1st past clearance

Delivery of drugs at desired concentrations into the body is severely hindered in cases where drugs undergo extensive first-pass hepatic metabolism.

POLYMERS IN GENERATION OF SR-TABLETS

Inclusion of polymers results in unit doses with characteristic effects. A polymer is a big unit molecule with recurring small unit (atoms) joined through covalent bonds.[14]

TYPES OF POLYMERS-

(1) Hydro-phobic polymers

(2) Lipid polymers

(4) Hydrophilic polymers

(5) Biodegradable polymers

(6) Mineral based polymer[15]

1. Hydrophobic polymers

This technique uses retardant hydrophobic non reactive polymer as matrix to slow drug release. Admixed drug and hydrophobic non reactive polymer (e.g. polyethylene, PVC, EC) pressed into tablet of required size. Drug is trapped in-between units of polymers, which supports drug delivery. E.g. Ethyl cellulose, Cellulose acetate.

2. Lipid polymers

A lipid material is used as an imprisoning agent. Works on either pore diffusion plus matrix erosion. E.g. Carnauba wax, Hard Fats, Tri-palmitin. Un-reactive, un-corrosive & insoluble polymer that prolong release in aq. environment.[16]

3. Hydrophilic polymers

Polymers can be used in this type of system so called swell able matrices. They have high molecular wt., high gelling quality e.g. Methyl cellulose, Hydroxypropylmethylcellulose, Carbomers, Alginate.

4. Biodegradable polymers

They consist of biodegradable polymers that break down either by enzymatic or non-enzymatic processes into by-products that are excreted by the body, e.g. polyanhydrides, proteins, polysaccharides. These polymers can be natural polymers such as proteins and polysaccharides, semi-synthetic polymers or fully synthetic systems.

5. Mineral based polymer

They consist of different types of polymers derived from algae e.g. alginic acid. Mineral polymer is further 3 classes-

i. **Macro porous -** Drugs moves through pores size 0.1to 1 µm.

ii. **Micro (µ)-porous -** Pore size scales from 50 and 200 A°.

iii. **Non - porous -** No pores are present & molecules moves through mesh networks.[17]

LIST OF MARKETED SUSTAINED RELEASE FORMULATION

BRAND NAME	DRUG	MANUFACTURER
Anafelx SR	Naproxen sodium	ACI Limited
Anril SR	Nitroglycerine	Square Pharmaceutical Ltd.
Arofil SR	Theophylline	Incepta Pharmaceuticals Ltd.
Bucod SR	Butamitrate citrate	Sharif Pharmaceuticals Ltd.
Cardizem SR	DiltiazemHCl	Drug International Ltd.
Dia M SR	Metformin HCl	Medimet Pharmaceuticals Ltd.
Lithin SR	Lithium Carbonate	Albion laboratories Ltd.
Sultion SR	Salbutamol	Square Pharmaceutical Ltd.

2. CONCLUSION

The article describes the details about Sustained release tablets, their formulation approaches, advantages of SR tablets over conventional tablets and various SR tablets available as marketed formulations. Multiple physio-chemical and biological parameters affect the formulation of SR tablets. From the above discussion it is well enough clear that SR tablets can be a promising, effective subject to be used in present and future

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