Self Emulsifying Drug Delivery Systems: An Potential Approaching Techniques - Review Article

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Abstract- *TSelf emulsifying drug delivery system to improve the oral bioavailability of the poorly aqueous soluble drugs. SEDDS are isotropic mixtures of oils , surfactants and solvents and co solvents. The principle characteristics of these system is ability to form fine oil -in-water emulsion upon mild agitation following dilution. The dilution can occur in aqueous phase. SEDDS may be a optimistic master plan to improve the rate and extent the oral absorption . Totally the articles contains the formulation, excipients, mechanism of SEDDS, composition, evaluation of SEDDS and application .*

Keywords- self emulsifying drug delivery system, bioavailability, isotropic mixtures, poorly soluble drugs.

I. INTRODUCTION

EMULSIFICATION : Emusification is a process of dispersing one liquid in a second immiscible liquid by applying hydrophobic interaction between bioactive compounds and an encapsulation Materials.

SELF EMULSIFICATION: self emulsify shortly in gastrointestinal fluid under influence light agitation for peristalic movement of GIT tract .

This process based on BCS classification class -2 category , it as low solubility and high permeability.

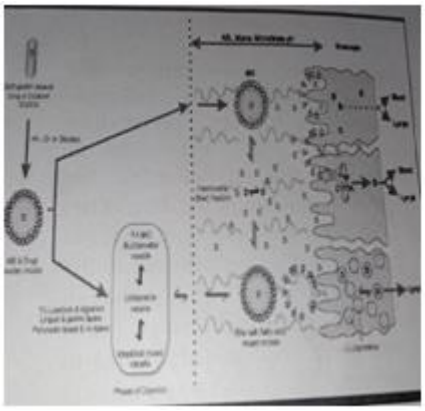
SELF EMULSIFYING DRUG DELIVERY SYSTEMS:

- SEDDs or defined asotropic mixture of drugs
- This isotropic mixture of sedds depends on the oil surfactants solvent and cosolvents. Sedds are characteristic by vitro lipid droplet sizes of 200nm to 500nm.
- Formulation used in medium chain dry glyceride oils and non ionic surfactants that provide gastric mobility with mild agitation in GIT . PROCESS :
- SEDDS are administered orally and absorbed by the lymphatic system
- In lymphatic pathway sets leaves to solubilize the drug by sequently absorption
- Sedds are administered as a unit dosage form for per oral administrator because they are used to solve low biavailability is used to poorly soluble and highly permeable compounds
- Minimum dose of drugs as compared to conventional dosage form.

PURPOSE :

Formulating device that can introduce a therapeutic substance in body and improve efficacy. Emulsification can control the rate ,time and place of release drug in body .

FORMULATION OF SEDDs - Excipients in Sedds - it is a kind of solid or liquid formulation the formulation composed of isotropic mixtures. The mixtures contains



- Oils
- Surfactants
- Cosolvents.

1. OILS :

1. It has been used in the different degree of saturation oil have long and medium triglyceride chains with bearing in number of bonds.
2. 2.Oils have long and medium triglyceride chains with varying in number of bonds.
3. Oils has higher fluidity ,better , solubility, self - emulsification ability.

4. Oils provide "Natural" basis for lipid vehicles but these poor ability to dissolve large amount of hydrophobic drugs.
5. Oils - vegetable oil have widely used since this Excipients form good emulsification system with their large number of surfactants.

Example of oils :

- cotton seed oil
- Soya bean oil
- Corn oil
- Sunflower

2. SURFACTANTS : Surfactant is employed for the design of self emulsification system few surfactants or orally used .

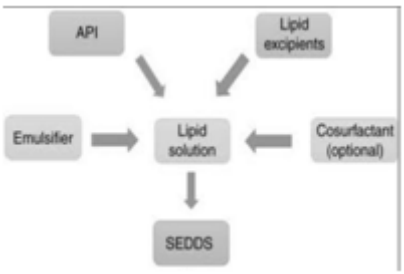
Types of Surfactants

1. Non- ionic surfactant
2. Cationic surfactant
3. Ampholytic surfactant
4. Anionic surfactant

1. Non - ionic surfactant : High hydrophilic - balance. It is less toxic .It leads to reversible charges in the permeability of intestinal lumen. Hydrophilic group carry snow charger but they use derives it water solubility from highly polar group such as polyoxyethylene.
2. Cationic Surfactants: that have this surfactant that have positively charged functional group it is composed of polar and nonpolar part. Example: c8c10 alkyl hydroxy ethyl Cationic surfactant are substance that bear positive charges and and efficiently absorbed on the materials posessed with the negative charge through strong electrostatic or charge to charge interactions.
3. Ampholytic surfactants : It is a Zwitter ionic surfactants.So also called a amphoteric surfactants. It contains both negative and positive charge. Acids donate protons and bases accept protons.It depending on the pH of the solution. Example: Lauryl hydroxy sultaine.
4. Anionic Surfactants : This surfactant is a hydrophilic carrier with negative charge.The negative charge that can complex with a counterion may lead to be a cationic surfactant. A surfactant helps to molecules life and suspend soils in micelles. Uses - The anionic surfactant used for frequently in soaps and detergents to remove the dirt and oils stains. Adsorption - 2.4 mg / Example: sodium Lauryl sarcosinate.
5. Co- surfactants/ co- solvent : Co- surfactant Of HLB value 10 to 14 is used .It is preferably alcohols of intermediate change length organic solvents are suitable for oral administration.
6. Consistency builder : consistency of emulsion such material includes pragaganth cetyl alcohol stearic acid and bees wax.
7. Polymers: inner polymers matrix represent from 5 to 40% of composition relative to their waiter it is not ionisable at physiological pH and being capable of forming matrix.

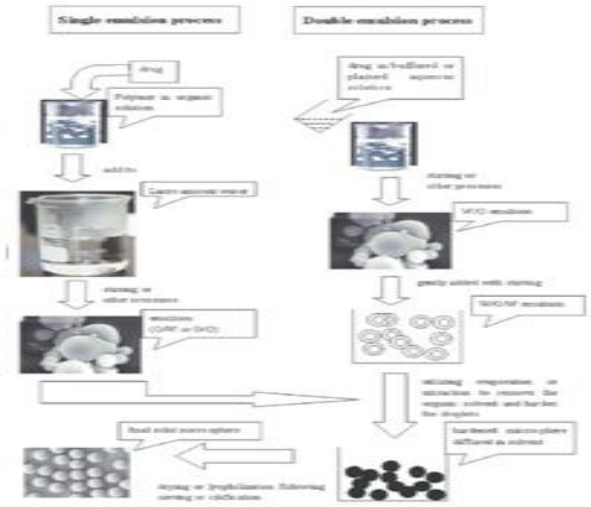
Drug + Mixture + oils + Surfactant + co- solvents FORMULATION

Large variety of waxy and liquid excipients. Formulation can prepared by some combination that could be formulated.



Steps for formulation of SEDDS:

- Solubility of drug in different ways of oils surfactants and co-solvents.
- Select the oil,surfactant and co-solvents based on BCS classification of drugs solubility. Excipients are prepared on based on phase diagram of drug.
- Dissolve the drug into the excipients - (optimal oil - surfactants ratio is required) Design the SEDDS.
- Addition of drug to SEDDS is cause critical (it leads to change oil: surfactants ratio).
- SEDDS formulation us made by adding the polymer/ gelling agent.



Mechanism:-

SEDDS fabricated in the form of tablets self emulsification that promote free energy in emulsifying fine process that can be increase surface area of this person of the SEDDS. Self emulsification related to energy for direction function in convulsion of emulsion that can create new surface in oil / water phase.

$$\Delta G = \sum_{i} N_i \pi r_i^2 \sigma$$

ΔG = free energy associated with process.
N = Number of droplets r = Radius

Two emulsion phases are likely to separate that can decrease the interfacial area resulting past the inter facial energy and their provides barrier against coalescence .

Lesser interfacial tension gives lesser free energy to form stable emulsion.

Characteristic of SEDDS :

- Visual assessment
- Turbidity measuring
- Droplet size
- Zeta potential measurement
- Determination of emulsification time
- Global size of SEDDS - (100 nm- 300nm)

Concentration of oil- (40% - 80%)

Drug properties of SEDDS :-

- Drug dose should be high
- Drug should be oil soluble
- High melting point of drug is poorly suited to SEDDS. LogP value should be high.

Evaluation of self emulsification drug delivery system:

1. Appearance: Filled capsule should no sign of leakage, discoloration, pinhole and small distortion .Trace /observe the particulate matter of drug participation.
2. Weight uniformity: Found the weight uniformity of drug with comply by followed procedure of I.P 95 standard .
3. Drug content : Determine the range of 99%- 101% which as in agreement with pharmacopeia specifications.
4. Micrometric properties : These properties are used for evaluating the bulk density, tapped density, compressibility index, angle of repose and flow ability.
5. Thermodynamic stability index : poor physical stability of formulation can lead to phase diagram of excipients. Thermodynamic stability studies as some studies Heating cooling cycle Centrifuge Freeze thaw cycle.
6. Dispersibility Test : The dispersibility test for mass of test portion and value for water content and total solids.
7. Determination of pH: Determination of pH value of the drug this change may be attributed to acidic nature of drug.
8. Turbidimetric : Add 0.1Hcl with 50rpm speed of continuous stirring on magnetic plate at particular temperature They can increase turbidity Determine the changes of turbidity by using the turbidmeter Monitor the rate of drug.
9. Viscosity determination : Evaluated the viscosity by using Brookfield viscosmeter, wheather the system is in oil/water (or) water/ oil [vol 33,34]
10. Droplet size analysis: Droplet size of emulsion is determine by photon correlation spectroscopy by using zetasizer able to measure size between 10nm to 5000nm.
11. percentage transmittance : It can proof the transparency of formulation particular wavelength using UV spectrometer with distilled water.(>99% of transmittance of the formulation of SEDDS have transparent nature).
12. Electro conductivity test: The test is performed by measuring the electro conductive nature of the system. The charge of an oil droplet is as negative due to presence of fatty acids.

Application of SEDDS :-

- Improvement solubility
- Promote of bioavailability

- Protect against biodegradation
- Control release of drug

II. CONCLUSION

- Self emulsifying drug delivery system approaching the techniques of formulation of drug compound with poor solubility of drug .
- It can be used to improve the oral bioavailability.
- Enhance the absorption and dissolution rate of compounds
- Easy to manufacturing of drugs
- It is useful to commercial success and improvement of NDA'S and ANDA 'S for the upcoming years.

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