Self Emulsifying Drug Delivery System - Review Article

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Abstract- *Self emulsifying drug delivery system are isotropic mixtures of oils, surfactants and co- solvents that spontaneous form oil-in-water emulsion upon mild agitation in GIT.These system have been developed to improve the oral bioavailability of drug . SEDDS are administered orally in soft or hard gelatin capsules.once they reach the stomach , they are dispersed by the churing of the stomach content and form stable emulsion.This emulsification process can improve the dissolution rate and absorption of the drug , leading to enhance bioavailability.*

Keywords- oral bioavailability, GIT ,oil-in- water emulsion, dissolution rate, SEDDS.

I. INTRODUCTION

Self emulsifying drug delivery system are a promising approach to improve the oral bioavailability of poorly water soluble drugs.It is a type of formulation . The formulation of SEDDS contains oils , surfactants and co-surfactant of isotropic mixtures. SEDDS are work by increasing the solubility of drug in the gastrointestinal tract . when ingested , the SEDDS rapidly emulsifying in the GI fluids that forming a fine o/w emulsion. The small size of oil droplets and high surface area provide allow for rapid absorption of drug through the GI tract .

Purpose of SEDDS :

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

Components in the SEDDS:

SEDDS are typically consist of three components :

1. **Oils :** The oil serves a vehicle for the drug and provides continuous phase for the emulsion

Common oil used in the SEDDS includes medium - chain triglyceride (MTC) oil , olive oil and soyabean oil.

2. **Surfactant** : The surfactant reduces the interfacial tension between the oil and water phases , allowing the emulsion to form spontaneously upon agitation .Common surfactants used in the SEDDS includes polysorbate ,poly oxyethylene glycol block copolymers.

3. **Co-solvents** : Co-solvents can be added to SEDDS formulation to further increase the solubility of the drug and enhance the emulsification process .Common co solvents includes ethanol, propylene glycol and of polyethylene glycol..

Properties of SEDDS :

The highlights properties of SEDDS ,

1. SEDDS can incorporate both hydrophobic and hydrophilic drugs within their oil surfactant mixtures.
2. SEDDS can be used for solid as well as liquid dosage form .

Advantages of SEDDS:

1. Enhance the solubility and bioavailability poorly water soluble drugs:
   SEEDS can solubilze the large amount of liphophilic drugs , significantly they can improve their absorption from the GIT tract .
2. Reduced first pass metabolism :
   The small droplets size of SEDDS emulsion allows the drug to the lymphatic system , by passing the liver and reducing the first pass metabolism.
3. Improved stability : SEDDS are typically more stable than traditional emulsion , providing better shelf life and reduced the degradation of the drug.
4. Enhanced patient compliance : SEDDS formulation can be administered in soft and hard gelatin capsules , compliance to liquid or tablet Formulation.

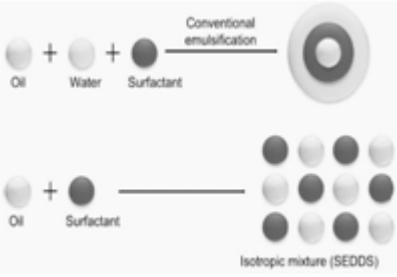
Disadvantages of SEDDS :

Several advantages of SEDDS enhance the bioavailability of poorly soluble drugs .but they also have potential draw backs that's should be considered when formuating and evaluating the system. Here are some main disadvantages of SEDDS:

1. High surfactant concentration : SEDDS are typically contains a high concentration of the surfactant (30 %-60% w/w) which can cause gastrointestinal irritations and some disruption in the stomach .
2. Low drug loading capacity : Conventional SEDDS often have a low drug loading capacity , limiting the use of high - dose drugs This is because the high concentration of surfactants and co- solvents reduced the volume available of the drug.
3. Drug leakage : There is a risk of drug leakage from liquid SEDDS , especially during storage and transportation . This can lead to reduce drug stability and bioavailability.
4. Low stability : Liquid SEDDS can be unstable , especially at higher temperatures presence of humidity .

Procedure for SEDDS :

SEDDS are isotropic and thermodynamically stable systems consisting of oils, surfactants and co-solvents and drug components. This components are includes in the procedure ;



- Select the appropriate excipients . This includes selecting an oil, surfactants and co- surfactant that are compatible with the drug and that will form a stable emulsion.
- Dissolve the drug in oil phase . This may require heating or stirring to ensure complete dissolution.
- Add the surfactant and co-surfactant to the oil phase .Stir until the homogeneous mixture is formed.
- Evaluating the SEDDS for stability . This can be done by measuring the droplet size, Zeta potential, turbidity measuring and viscosity of the emulsion.
- If necessary , adjust the formulation of SEDDS . This may involve adding more oil, surfactants and co-solvents.
- Once the SEDDS is stable,it can be filled into the capsule or other dosage forms.

Techniques for SEDDS Formulation :

- Solidification techniques for transforming liquid or solid Melt extrusion
- Spray drying
- Melt extrusion spheronization

Dosage form of SEDDS :

1. Oral
2. Topical
3. Occular pulmonary delivery

Mechanism of SEDDS :

The series steps of SEDDS involved in the GI tract that enhance the absorption and bioavailability of poorly soluble drugs.Here' s detailed information of mechanism ;

1. SEDDS are rapidly dispersed in the aqueous environment of the GI tract forming o/w emulsion.This is facilitated by the presence of surfactants and co-surfactant in the SEDDS formulation.
2. The drug molecules are solubilzef in the oil phase of the o/w emulsion.This enhance by the large interfacial area created by the fine emulsions.
3. Lipase secreted by the pancreas and stomach hydrolyze thetri glyceride in the oil phase of the o/w emulsions.This produce free fatty acids and mono glycerides.
4. Mixed micelles are formed by the interaction of the free fatty acids, mono glycerides, surfactants and co-surfactant.The drug molecules are solubulized within hydrophobic core of the mixed micelles.
5. Mixed micelles containing the drug molecules are absorbed into the intestinal lymphatic system, this can bypasses the first pass effects , where drug would be metabolized by the liver before reaching the systemic circulation.
6. The drug molecules are transported to the various tissues and organs throughout the body via the lymphatic system.

Evaluation of SEDDS :

The evaluation of SEDDS is important to ensure their quality, safety and efficacy of the drugs.some of the key parameters that are evaluated includes :

- Self emulsification time : This is the time taken for SEDDS to form a stable emulsion when dispersed in water.A shorter emulsification time is desirable[37].
- Droplet size : drop the droplet size of the emulsion is important for factors such as absorption, stability and apperance smaller droplet size are preferred.
- Zeta potential : This is the measuring of the surface charge of the emulsion droplets.A high Zeta potential help to prevent the droplets from coalescene and forming larger droplets.
- Drug solubility : the SEDDS should be able to solubulized the drug to be a sufficient concentration.
- Drug release : The SEDDS should be release the drug in a controlled and consistent manner.
- Stability : The SEDDS should be stable over time , under a range of storage conditions.

Application of SEDDS :

1. Improved bioavailability of drug and improve Solubility of drug.
2. Protection against biodegradation.
3. Controlled release of drug.

II. CONCLUSION

Self emulsifying drug delivery system are promising strategies for the formulation of drug components with poor aqueous Solubility.

The oral delivery of hydrophobic drugs can be made by possible SEDDS , which have been shown to substainally improving oral bioavailability.

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