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Mini Review

AN APPROACH TO ENHANCING THE BIOAVAILABILITY, DISSOLUTION, AND SOLUBILITY OF DRUGS

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ABSTRACT

Pharmaceutical particle technology is used to improve drug compounds' low dissolution rate in the gastrointestinal fluids following oral administration, which limits their bioavailability due to their poor aqueous solubility. The molecule innovation includes a few methodologies from the regular size decrease cycles to the more up to date, novel molecule innovations that change the dissolvability properties of the medications and produce strong, powdered type of the medications that are promptly solvent in water and can be effectively formed into different measurement structures. The solid particle technologies that can be used to improve the aqueous solubility, dissolution, and bioavailability of drugs are highlighted in this overview. Solubility, dissolution, and gastrointestinal permeability are fundamental parameters that control the rate and extent of drug absorption as well as its bioavailability, as has been well explained. A drug's water solubility is a fundamental property that is crucial to the drug's absorption after oral administration. In addition, it regulates whether a drug can be administered via parenteral route and is useful for manipulating and testing drug properties during the drug design and development process. While the dissolution rate at which the solid drug or drug from the dosage form enters solution is crucial when the dissolution time is limited, drug solubility is an equilibrium measure. Aqueous solubility and drug permeability are also important parameters attributed to oral bioavailability, despite the fact that a drug's oral bioavailability depends on its aqueous solubility, drug permeability, dissolution rate, first-pass metabolism, and susceptibility to efflux mechanisms. In recent years, there has been an increase in the number of insoluble drug candidates in drug discovery, with almost 70% of new drug candidates lacking water solubility. After oral administration, these drug candidates' bioavailability is limited by their poor aqueous solubility and dissolution in gastrointestinal fluids.

Keywords: Bioavailability; Gastrointestinal fluid; Metabolism

INTRODUCTION

Increasing the dissolution rate of poorly soluble drugs and improving their bioavailability is an important challenge for pharmaceutical scientists because in vitro dissolution has been recognized as an essential component of drug development. The highest dose strength in an immediate release

oral product serves as the basis for the food and drug administration criterion that determines a drug's solubility classification in BCS. A drug is said to be highly soluble if its highest concentration dissolves in 250 milliliters or less of aqueous media with a pH between 1.0 and 7.5; otherwise, the substance is said to be poorly soluble. In contrast, the permeability classification is based either directly on the amount of a drug substance that is absorbed by the intestinal tract in humans or indirectly on measurements of the rate at which mass is transferred across the intestinal membrane in animals or humans. When the extent of intestinal absorption is determined to be 90% or greater in comparison to an intravenous reference dose, a drug substance is said to be highly permeable [1-3].

DISCUSSION

The dissolution rate of BCS class II drugs is likely to limit their bioavailability. However, due to their high permeability, BCS class II drugs have recently been the focus of solubility enhancement research, and several formulation strategies have been developed for this class of compounds. The bioavailability of class III drugs is limited by permeability rate, but dissolution is likely to occur quickly. As a result, for drugs, using absorption enhancers to make IR solid dosage forms can be a good way to make them more permeable. However, the bioavailability of BCS class compounds is constrained by both intestinal permeability and dissolution. Since solubility and dissolution enhancement alone may not help improve their bioavailability, BCS class drugs are frequently unsuitable candidates for drug development due to their low membrane permeability. However, the permeability issues associated with these classes of compounds cannot be ignored. Micronization is a standard method for reducing the size of particles and is a common method for making drugs more soluble. It is a straightforward process that involves transferring a coarse drug powder to an ultrafine powder with a mean particle size of 2–5 m and very few particles smaller than 1 m. Although micronization does not alter the drug's equilibrium solubility, it does alter the active ingredient's ability to dissolve or diffuse from the drug particles by increasing the surface area to drug ratio. Mechanical commination, such as crushing, grinding, and milling of previously formed larger particles, is how pharmaceuticals are typically reduced in size. These processes use pressure, friction, attrition, impact, or shearing to reduce the size. Drugs can be mechanically micronized using ball mills, jet mills, and high-pressure homogenization, but dry milling in a fluid energy mill is the preferred method. These strategies for size decrease have been accounted for in different examinations to have expanded the disintegration and bioavailability of ineffectively watery solvent medications by diminishing their size and expanding the surface region of the medications. Various pharmaceutical particle technologies can be used to improve a drug entity's aqueous solubility. There are two categories of particle technologies: the older methods and the more recent, innovative particle technologies. Mechanical micronization techniques are the standard means of reducing drug particle size and increasing surface area, both of which improve the solubility and dissolution of drugs that are not easily soluble. Due to their low efficiency, conventional particle technologies are limited for some drugs, sometimes resulting in drug thermal and chemical degradation and non-uniform sized particles [4-6].

CONCLUSION

The fresher novel molecule procedures can defeat the impediments of the ordinary strategies and are more effective techniques for forming inadequately dissolvable medications. The principle of size reduction for solubility enhancement is still the foundation of the novel methods, which were

developed from conventional ones. There has been discussion about how polymers, cyclodextrins, and liposomes can be used to make drugs that don't dissolve well. These materials have a lot of potential uses for making drug formulations more soluble and stable. In order to improve the water solubility of drugs that are poorly soluble in water, each particle technology has its own significance and potential application. Consider the properties of the drug to be formulated and the desired dosage form when selecting an appropriate method. In the field of pharmaceutical particle technology, additional approaches to the formulation of various drugs with low aqueous solubility have not yet been investigated.

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