Innovative methods to increase the oral bioavailability of medications.

Awdesh Nayak Lal*

Division Biochemistry and Postharvest Technology, ICAR-Central Potato Research Institute, Shimla, India

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Description

Oral administration of drugs is the most common route of drug delivery. However, many drugs have poor solubility in water, which can limit their absorption in the gastrointestinal tract and result in low oral bioavailability. Poorly soluble drugs have become increasingly common in drug development, and addressing their low bioavailability has become a significant challenge in the pharmaceutical industry.

The oral bioavailability of poorly soluble drugs is influenced by several factors, including the physicochemical properties of the drug, the formulation design, and the physiological conditions of the gastrointestinal tract.

The solubility and permeability of the drug are the two main physicochemical properties that determine its oral bioavailability. Poorly soluble drugs are often hydrophobic and have low solubility in water. This results in low dissolution rates and limited absorption in the gastrointestinal tract, leading to low oral bioavailability. Additionally, poorly soluble drugs may have low permeability across the gastrointestinal epithelium, further limiting their absorption.

The formulation design can significantly affect the oral bioavailability of poorly soluble drugs. The formulation can enhance the solubility and dissolution rate of the drug, leading to improved absorption. Several formulation strategies can be used to improve the oral bioavailability of poorly soluble drugs, such as micronization, solid dispersion, Self-Emulsifying Drug Delivery Systems (SEDDS), and liposomes.

The physiological conditions of the gastrointestinal tract can also influence the oral bioavailability of poorly soluble drugs. Factors such as pH, motility, and enzymatic activity can affect drug dissolution and absorption. For example, the acidic environment of the stomach can impact drug solubility and dissolution, while the slower motility of the colon can allow for better absorption of certain drugs. Several strategies can be used to improve the oral Bioavailability of poorly soluble drugs. These strategies can be broadly classified into formulation-based and non-formulation based approaches.

Formulation-based approaches aim to enhance the solubility and dissolution rate of the drug to improve its oral bioavailability. Several formulation strategies can be used to achieve this, including micronization involves reducing the particle size of the drug to increase its surface area and improve its dissolution rate. This approach has been shown to improve the oral bioavailability of poorly soluble drugs. Solid dispersion involves dispersing the drug in a hydrophilic carrier to improve its solubility and dissolution rate. This approach has been used successfully to improve the oral bioavailability of several poorly soluble drugs. SEDDS are lipid based formulations that can enhance drug solubility and dissolution by forming emulsions in the gastrointestinal tract. This approach has been shown to improve the oral bioavailability of poorly soluble drugs. Liposomes are lipid-based vesicles that can encapsulate the drug and improve its solubility and bioavailability. This approach has been used successfully to improve the oral bioavailability of several poorly soluble drugs.

Non-formulation-based approaches aim to improve drug absorption by manipulating the physiological conditions of the gastrointestinal tract. Several non-formulation-based approaches can be used to achieve this, including Prodrug design involves modifying the drug molecule to enhance its solubility and permeability. This approach has been used successfully to improve the oral bioavailability of several poorly soluble drugs.

*Correspondence to

Awdesh Nayak Lal,

Division Biochemistry and Postharvest Technology,

ICAR-Central Potato Research Institute,

Shimla,

India,

E-mail: awadh_nay@yahoo.com

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