

Solubility and permeability studies of novel co-crystals of selected flavonoids

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The therapeutic efficacy of drugs is determined by many factors. Examples of such factors include the solubility of the active pharmaceutical ingredient (API) and its permeability.

From a pharmaceutical point of view, an active ingredient is classified as highly soluble if the highest single therapeutic dose is completely soluble in 250 milliliters (ml) of aqueous solutions at pH 1.2–6.8 at 37±1 °C. The assessment of API permeability through biological membranes of a living organism is based on pharmacokinetic studies determining the degree of absorption of the active substance, e.g., absolute bioavailability or mass-balance

The correlation between solubility and permeability was used to divide active substances into 4 groups - BCS (Biopharmaceutics Classification System):

- Class I: high solubility, high permeability
- Class II: low solubility, high permeability
- Class III: high solubility, low permeability
- Class IV: low solubility, low permeability [1,2]

Based on the BCS classification, it was estimated that approx. 40 - 60% of active substances present on the market have poor solubility, and in the case of newly designed particles, even approx. 90% may belong to BCS classes II and IV.[3] Therefore, for selected active substances it is necessary to improve their solubility and permeability. The most commonly used methods of increasing API solubility are chemical or physical modifications.[4]

Flavonoids are biologically active substances exhibited a range of health-promoting effects such as antioxidation, anti-inflammatory, antitumor pharmacological properties [5]. While these compounds are promising in terms of efficiency, their low solubility and poor bioavailability [6] decreased their potential of possible application in pharmaceutical formulations. The aim of our research was to synthesize novel co-crystals of selected flavonoids with cofomers containing N-heterocyclic aromatic unit in order to improve the solubility. As part of the work, we examined and compared the solubility and permeability of co-crystals with pure compound. The improved permeation rate and solubility of studied co-crystals allows us to preliminarily assume that the bioavailability of the substances present in co-crystal will be improved over its uncomplexed form.

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