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Comparison of solid dispersion and nanosuspension for improvement of drug absorption

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Currently, drug discovery technology is heavily dependent on combinatorial chemistry and high throughput screening, resulting in more and more poorly water-soluble drugs, either class II (low solubility and high permeability) or IV (low solubility and low permeability) in the standard biopharmaceutical classification system. Owing to the importance of solubility/dissolution for oral absorption, formulation scientists face a great challenge. Thus, strategies have been proposed to improve the solubility and dissolution rate. Among these approaches, solid dispersion [1] and nanosuspension [2] are the most usually used. However, which one is better for improving the *in vitro* dissolution and *in vivo* bioavailability? Some experts have already asked this question and made some efforts to answer it. However, the research carried out to date has involved a limited number of model compounds [3].

The aim of this research is to give a comparison, in terms of the *in vitro* dissolution and *in vivo* pharmacokinetics, of solid dispersion and nanocrystals, with different substances (lacidipine,itraconazole, nimodipine, ziprasidone, and etc.) as model compounds. The data are mainly summarized from previous research in our group. The solid dispersions were prepared by the melting method or the solvent method, while the nanocrystals were obtained by media milling or high pressure homogenization. Then, they were characterized by PSD, TEM, DSC, XRD, FTIR, and SEM analysis. Finally, the pharmacokinetic study was carried out in beagle dogs. We found, in most cases, that solid dispersion exhibited higher dissolution profile, while nanocrystals produced the greater increase in oral bioavailability. More importantly, the *in vivo* pharmacokinetic results did not agree with the *in vitro* dissolution

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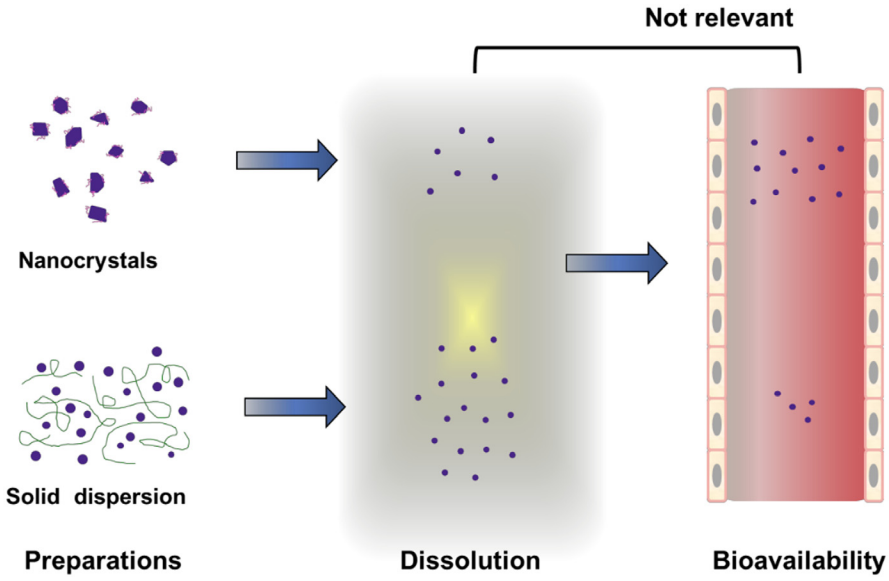

Fig. 1 Illustration for the *in vitro* dissolution and *in vivo* pharmacokinetic profiles for different strategies (solid dispersion, nanocrystals and micronization). Solid dispersion exhibited higher dissolution profile, while nanocrystals produced the greater increase in oral bioavailability.

profiles. In addition, data in the literatures were also reviewed to support our viewpoint.The results here demonstrate that the use of *in vitro* dissolution tests for the prediction of *in vivo* behavior is of limited value for poorly water-soluble drugs when giving comparisons of different formulation strategies. The results obtained in this work will provide guidance for the research and development of poorly water-soluble drugs.

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REFERENCES

[1] Prudic A, Ji Y, Sadowski G. Thermodynamic phase behavior of API/polymer solid dispersions. Mol Pharm 2014;11:2294–2304.
[2] Rabinow BE. Nanosuspensions in drug delivery. Nat Rev Drug Discov 2004;3:785–796.
[3] Zhang HK, Luo YQ, Yang S, et al. Increased dissolution and oral absorption of itraconazole/Soluplusextrudate compared with itraconazole nanosuspension. Eur J Pharm Biopharm 2013;85:1285–1292.