

## Ternary Amorphous Solid Dispersions

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### Editorial

Amorphous solid dispersion is one of the techniques used in the formulation development of poorly soluble compounds. Due to the advancement in basic physicochemical understanding of amorphous systems, the utilization of this techniques has immensely increased in enabling the delivery of the difficult to solubilize compounds. Traditional binary solid dispersions contain a drug dispersed in a single polymer matrix, whereas in recently developed ternary solid dispersions three components i.e., API, polymer, and an additive are present [1-7].

In both the systems, API is present in amorphous form and polymer is used for the stabilization of this amorphous form via decrease in molecular mobility or via drug-polymer molecular interactions. The third component is usually a surface-active agent or another polymer depending on the desired dissolution/stability profiles of the drug. For example, if the faster dissolution is desired then surfactant would be a better choice and if the prevention of re-crystallization is needed then another polymer with higher Tg may be used in developing the ternary solid dispersions.

One of the challenges associated with developing ternary dispersion is the selection of appropriate polymers/surfactant and their combinations. In those cases, solution studies can be successfully used to distinguish the ability of individual polymer vs. combined polymers for synergistic effect in terms of dissolution enhancement or amorphous stabilization or both [2]. The parameters studied in such solution state screening studies usually are the ability of polymers or their combinations to inhibit precipitation and maintaining supersaturation (Figure 1).

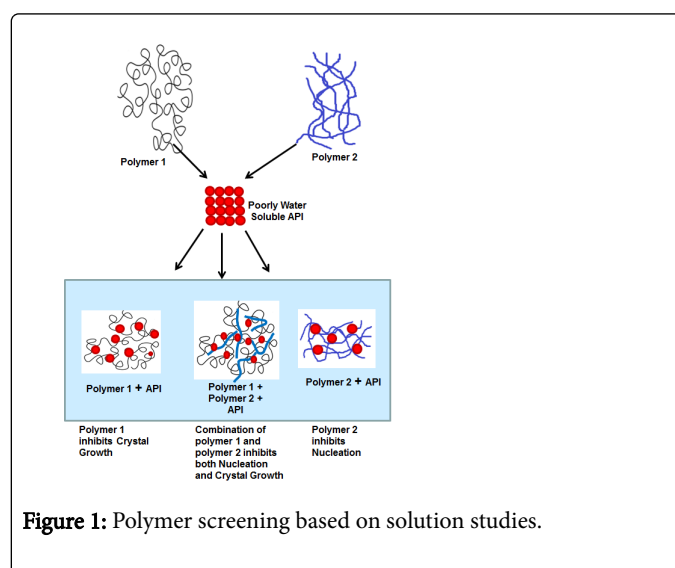


Figure 1: Polymer screening based on solution studies.

The prepared ternary solid dispersions can be characterized by technique such as DSC/MDSC, PXRD, and FTIR. These techniques are used to determine important parameters such as the glass-transition temperature of amorphous components, the crystallinity of the drug and the molecular interaction between drug and excipients.

The future research focusing on the 1) combination of polymers to tailor the release profile and stability, 2) advance characterization techniques such as small angle X-ray scattering and solid-state NMR and 3) improvement in manufacturing of amorphous solid dispersions will progress the application of ternary solid dispersions strategy in resolving the challenges of current drug development program. The advancement of dedicated CROs for amorphous dispersions development and recent success of drugs such as Telaprevir (Incivek®) and Ivacaftor (Kalydeco®) suggests that this technique is capable of providing the desired approach for the development of poorly soluble compounds.

Finally, the fact that almost 40% of the new chemical entities are poorly water soluble in nature implies that studies with ternary solid dispersions will continue, and with increase understanding of these systems, more drug compounds formulated as solid dispersions will reach the market in the future.

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