**PURPOSE**

Nanosuspension (amorphous and crystalline) technology has been frequently used to address the low solubility and dissolution rate issues associated with BCS class II and IV drugs. Due to the apparent stability concerns, manufacturability and patient compliance, nanosuspension preferably are dried into solid powders for further downstream processes. Spray drying. Freeze drying and Pellet coating are some of the commonly used techniques to solidify nanosuspensions. Hot melt Extrusion (HME) is relatively more adaptive to continuous manufacturing compared to other conventional processes. Thus, it will be worthwhile to develop a novel nanosuspension drying technique using HME technology.

**OBJECTIVES**

- To explore and optimize drying of amorphous nanosuspension by a novel HME technique using Design of Experiment (DoE) methodology.
- Investigate critical quality attributes (CQAs) of HME dried nanosuspension.
- Develop and validate DoE model, for drying of amorphous nanosuspension.

**METHODS**

**RESULTS**

Optimization of nanosuspension drying by HME: DoE approach

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Characterization method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>SEM/FE-SEM, PXRD, DSC</td>
</tr>
<tr>
<td>Screw speed</td>
<td>PXRD, DSC, polarized light microscopy</td>
</tr>
<tr>
<td>Flow rate</td>
<td>PXRD, DSC, polarized light microscopy</td>
</tr>
</tbody>
</table>

Characterization studies

- **PXRD Studies**
  -鉴别峰的出现观察到Clotrimazole和MCC 101：Salipsul didn’t show any crystallinity.
  -Clotrimazole nanosuspension prepared by precipitation technique, devoid of MCC 101, didn’t show any crystallinity. However, physical mixture of clotrimazole suspensions showed crystallinity.
  -HME-dried clotrimazole nanosuspension showed crystallinity possibly due to presence of excess MCC 101.

- **Dissolution Studies**
  -Higher dissolution velocity was observed for Clotrimazole nanosuspension and HME-dried Clotrimazole nanosuspension compared to pure Clotrimazole.
  -Relatively higher dissolution rate was observed for Clotrimazole nanosuspension compared to HME-dried nanosuspension possibly due to formation of loose agglomerates while drying in HME.

**CONCLUSION**

- Hot melt extruder has been successfully used as a novel technique for continuous drying of low dose nanosuspension, resulting in embedding of drug moiety in a polymer matrix.
- Nano-sized drug particles play a vital role in enhancing kinetic solubility of the drug along with the enhanced solubilizing effects of the polymer matrix.
- Temperature and flow rate were critical process parameters influencing moisture content and dispersibility of drug nanoparticles after drying.

**REFERENCES**