the drug in its amorphous form into a carrier matrix (polyvinylpyrrolidone and polyethylene glycol) using various techniques such as spray drying and melt extrusion (Pouton 2006). However, it should be noted that amorphous solids are nonequilibrium solid phases and hence are generally less stable relative to their corresponding crystalline phases.

Lipid formulations are another option for solubilization of poorly soluble drugs. These formulations include oil-based systems, water-insoluble self-emulsifying drug delivery systems (SEDDS), water-soluble SEDDS, and systems that contain very little oil that disperses to form micellar solutions (Pouton 2006). The major advantage of the lipid delivery system is that the drug can be present in a stable liquid solution. This eliminates the time required to dissolve solid particles. Furthermore, the lipids used in the formulation may facilitate the transport of the drug substance across the intestinal membrane and further improve the absorption of drugs from lipid formulations (Pouton 2006). However, one possible concern associated with this type of formulation is drug precipitation on dilution as well as unexpected phase transformation to a more stable polymorphic form (Bauer et al. 2001).

In addition to the methods described earlier, the solubility of poorly soluble drugs can also be improved using solubilizing agents such as cyclodextrins. Cyclodextrins solubilize these poorly soluble compounds by forming water-soluble inclusion complexes with them. However, the dosage level can be limited by the use of this solubilizing agent, since there is a potential concern with regard to the toxicity of some commercially available cyclodextrins.

DEVELOPMENT OF DISSOLUTION METHOD

FDA is encouraging sponsors to use quality by design (QbD) in the development of their drug products. QbD means designing and developing formulations and manufacturing processes to ensure a predefined quality and understanding how formulation and manufacturing process variables influence product quality (Yu 2006). QbD consists of the following elements:

- Define target product quality profile.
- Design and develop product and manufacturing processes to meet the target product quality profile.
- Identify and control critical raw material attributes, process parameters, and sources of variability.
- Monitor and adapt processes to produce consistent quality over time.

Because *in vivo* drug dissolution and release is an essential step in delivering the drug to its site of action, it should be included in the target product quality profile of solid oral dosage forms. Under the QbD system, pharmaceutical quality is assured by understanding and controlling formulation and manufacturing variable, while end-product testing, including *in vitro* dissolution, confirms the quality of the product. In the context of dissolution, QbD implies establishing the relationships among raw material properties (such as particle size), formulation variables (excipient levels and grade), process parameters (such as compression force and blending time), and the target product quality profile. Efficient implementation of QbD requires a biorelevant dissolution test during product development. In a QbD system, product attributes such as particle size or polymorphic form that are previously monitored indirectly via a QC dissolution test are monitored and controlled through the design and control of the manufacturing process. Thus, under QbD, dissolution testing development should mainly focus on its clinical relevance.