Quotient Sciences

Molecule to cure. Fast.™

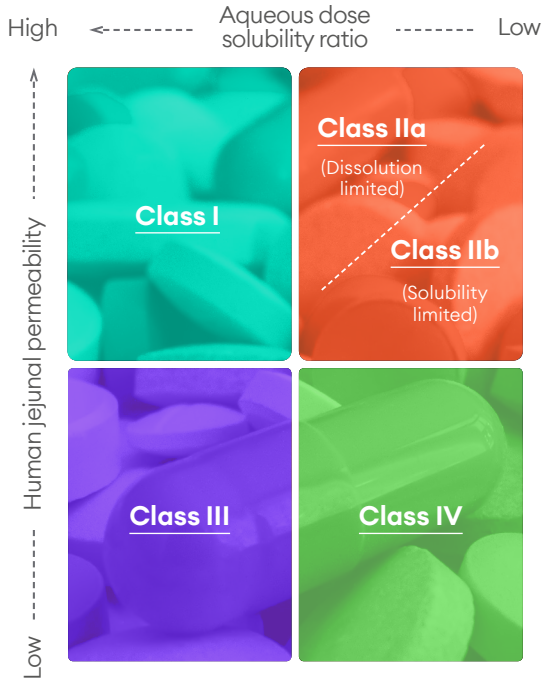
Information sheet

Formulation Strategies for Poorly Soluble Molecules

As the number of poorly soluble compounds continues to increase in the industry development pipeline, conventional formulation strategies may not be sufficient to achieve acceptable levels of solubility in the gastrointestinal tract and hence absorption into the systemic circulation. Scientists will need to utilize advanced formulation technologies to maximize oral bioavailability.

Our team understands that there are multiple formulation approaches available to address poor aqueous solubility and the Developability Classification System (DCS) provides a robust framework to help aid the technology selection process. We have developed an extensive internal Formulation Handbook, which incorporates the use of the DCS along with other key decision trees, developed by our senior formulation, analytical and manufacturing scientists globally. For poorly soluble molecules, our formulators gather a clear understanding of the physiochemical and biopharmaceutic characteristics of the molecule and determine whether it falls into a Class IIa or IIb category depending on their solubility being related to either dissolution or a true solubility challenge. The understanding of the mechanism behind the poorly soluble nature of the molecule allows appropriate formulation strategies to be applied, resulting in the targeted use of more complex formulation approaches.

If a molecule is a DCS Class IIa, simple approaches such as particle size reduction or the addition of wetting agents can be employed to increase the dissolution rate of the molecule, while Class IIb compounds may require the use of more advanced formulation strategies such as the development of amorphous systems, via the range of spray drying and hot melt extrusion.



Formulation Strategies for Poorly Soluble Molecules

Our formulation knowledge is complemented by the utilisation of a range of in vitro characterisation techniques using biorelevant media to screen formulation technologies and prototypes and make recommendations for systems to be taken forwards into preclinical and clinical studies. In addition, we can leverage internal expertise in physiological-based pharmacokinetic (PBPK) modelling and simulation to aid in the predictions of performance in humans, making it a truly holistic approach.

Selecting the Right Formulation Technology for Your Molecule

Formulation technology	Challenge and complexity DCS class				
	Class I	Class IIa	Class IIb	Class III	Class IV
API only	✓	✓			
Micronization		✓			✓
Nanomilling		✓			✓
Dissolution enhancers		✓			✓
Amorphous dispersions			✓		✓
Lipidic systems			✓		✓
Complexation			✓		✓
Efflux inhibitors				✓	✓
Permeation enhancers				✓	✓

Development Driven by Data

Each formulation is unique, just as each drug candidate is unique. At Quotient, formulation development is a data-driven process, where the strategy is the result of an analysis of the physiochemical characteristics of the API, the biopharmaceutics data package, the target product profile, the preferred manufacturing process and the strategic goals of the company.

Our approach first involves assessing simple formulation systems and then only increasing the formulation complexity, if needed, to achieve the desired preclinical or clinical performance. We always have the target product profile and final desired dosage form in mind, so that as the molecule progresses through development, the drug product strategy is robust with scalable processes to avoid any delays in the later stages of development. Our goal is to match the best enhancement technology for clinical success with our client's corporate goals, timelines and budget in mind.

Processing Technologies for Poorly Soluble Compounds

- Spray Drying
- Fluid-Bed Processing
- Roller Compaction
- Hot Melt Extrusion
- Particle Size Reduction

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