Bioavailability Enhancement

Lipid-Based Formulation Technology

Capsugel® | Lonza Pharma & Biotech

Lipid-based formulation (LBF) approaches — encompassing the use of lipid excipients, solvents, co-solvents in liquid, semi-solid or solid formats — are a key tool for improving solubility. LBF is primarily used for bioavailability enhancement, along with addressing food effects and associated variability. Additionally, liquid or semi-solid LBF approaches are routinely utilized for low dose/highly potent applications, due to the ability to achieve uniform API distribution at low dosing, and to minimize exposure hazard.

Capsugel® has premier technology depth in LBF, and specialized capabilities in LBF-based dosage forms to address poor API aqueous solubility and other formulation challenges. You can leverage this extensive expertise in LBF — utilizing liquid-filled hard capsules, soft gels and lipid multiparticulate approaches — to support projects from early design stages through commercial-scale manufacturing.

Flexible Technology

Lipid-based formulations are composed primarily of oils, co/surfactants or co-solvents that solubilize a drug in homogenous solutions. Suspensions have also been successfully developed and commercialized, in particular when high drug loading is required. Depending on their composition, LBFs range from oily to self-emulsifying and self-microemulsifying systems that may be liquid or semi-solid. Since they present the drug in a solubilized form, LBFs bypass dissolution and, upon dispersion and/or digestion, increase drug disposition in the intestinal lumen through a combination of exogenous and endogenous vesicles, along with super-saturated levels of free drug.
At the molecular level, certain lipidic excipients have been shown to reversibly inhibit enterocyte receptors such as the P-glycoprotein or Breast Cancer Receptor Protein, or CYP enzymes, which may provide unique benefits to drugs afflicted by efflux transport or pre-systemic metabolism.

In addition, there is growing evidence that certain drugs can harness the lymphatic absorption pathway and, to a certain extent, experience decreased levels of first-pass metabolism. Overall, LBFs provide clear benefits in terms of bioavailability enhancement, though other major benefits such as food effect or variability reduction have also been evidenced, and provide clear advantages to healthcare providers and patients.

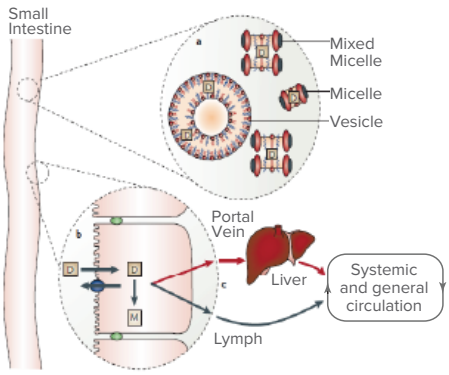

Figure 1. Lipid-based formulation can enable solubilization and disposition increase in the intestinal lumen; interaction with efflux, metabolism biological factors; and absorption through the lymphatic pathway.

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Proven Applications

Lipid/liquid-based technology addresses a broad range of formulation challenges and open up innovative applications, from controlled release to abuse deterrence.

Bioavailability	Multi-fold improvement in in vivo bioavailability demonstrated across a library of reference compounds
Dose Uniformity	Optimization of dose uniformity, ideal for low dose APIs
High Potency	Safer handling of high-potency APIs

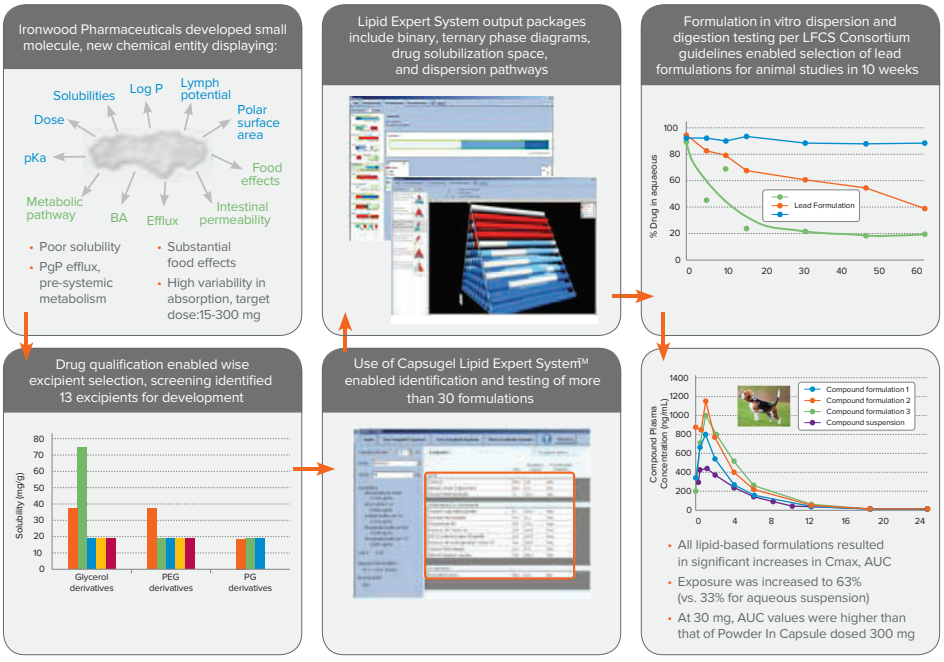
Safety & Stability

Lipid excipients are chiefly synthetic derivatives (glycerol, propylene glycol or polyethylene glycol esters) of naturally occurring fatty acids that are generally recognized as safe. Capsugel exclusively works with commercially available, pharmaceutical-grade excipients supplied by leading vendors that provide reliable and consistent excipient quality and comprehensive toxicology packages. Throughout the development process, LBFs are closely scrutinized for drug crystallization and degradation following ICH guidelines, while rigorous scale-up protocols monitor the robustness of formulations progressing to manufacturing stages.

Reliable Manufacturability

As a leading provider of innovative dosage forms and solutions, Capsugel has leading knowledge of excipient and formulation compatibility with hard and soft capsules. We have extensive experience developing and manufacturing liquid and semi-solid, low- and high-viscosity formulations including controlled substances, high potency/low dose and certain hormonal products in liquid or soft capsule formats. Co-located product development and manufacturing sites in the United States, Europe and Asia, all approved by global regulatory agencies, serve pharmaceutical and health & nutrition clients around the world.

Case Study



Learn more about how Capsugel's Lipid-Based Formulation Technology can help you overcome solubility and other formulation challenges.

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