Liquid-fill hard capsule (LFHC) technology provides an advanced dosage form offered in both gelatin and HPMC (hypromellose) for liquid, semi-solid, paste and multiparticulate applications. This unique, flexible and elegant dosage form has a proven track record for addressing complex formulation challenges and improving or re-positioning existing formulations. LFHC provides secure protection to drug compounds through leak-proof, airtight encapsulation which is impermeable to moisture, oxygen and light.

**Proven applications**

Liquid-filled capsules address a broad array of formulation challenges, often incorporating a variety of pharmaceutically approved lipid and non-lipid excipients. Formulation flexibility is a hallmark of our liquid-fill hard capsule formulation and manufacturing technology.

**Two sealing options**

Lonza’s engineering advancements in capsule sealing and filling of liquid hard-shell capsules, spanning more than 25 years, helps ensure consistent product quality and a robust, leak-proof seal using either of our two sealing technologies.

**Capsule banding**

A visible band of gelatin or HPMC is applied around the join between the capsule, sealing the cap to the body. This method is particularly useful for brand identification (band coloring), dose identification or tamper evidence. And when a capsule requires the application of a functional coat, banding provides a smoother surface at the cap/body interface for successful coat adhesion.

**“Fusion” capsule sealing technology**

Lonza’s proprietary Liquid Encapsulation Micro Spray or “Fusion” technology applies a fine micro-spray of sealing solution around the join between the body and the cap, so that the contacting surfaces of the cap and the body are effectively fused together.

- **Bioavailability**
  Multi-fold improvement in in vivo bioavailability demonstrated across a library of reference formulations

- **Dose uniformity**
  Optimal dose format for low dose uniformity

- **High potency**
  Safe handling of high-potency API challenges

- **API stability**
  Low-melting-point APIs; improvement in API moisture, oxygen and/or light stability

- **Clinical development tool**
  A simple manufacturing process and shortened development cycle for CTM and scale-up

**Combination products**

Dual capsule systems using LFHC technology are used for formulations where incompatible actives need to be separated or when a dual release profile is desired

**Colonic delivery**

Specially coated LFHC provide inherent advantages for drug delivery to the colon

**Abuse deterrence**

Abuse deterrence formulations using LFHC can incorporate a range of excipients specifically to the compound and typical routes of abuse.
Center of excellence for LFHC development and manufacturing

Our LFHC center of excellence in Edinburgh, Scotland (UK) serves a global market with integrated product design, development and manufacturing of pharmaceutical products. The facility is the largest dedicated pharmaceutical liquid and semi-solid production site using LFHC technology in the world. Lonza Edinburgh has an extensive track record in designing optimized lipid, semi-solid and liquid formulations, and advancing compounds from feasibility through clinic to commercialization.

The Edinburgh site is US FDA and MHRA accredited, and has controlled substance licenses as well as dedicated high-containment and isolation capability. The product development team at Edinburgh also draws on the network of Lonza product development sites in Europe and the United States, sharing best practices in identifying optimal technologies and approaches for formulation challenges. A full range of pre-formulation and feasibility studies, including solubility screening for new chemical entities, is conducted for client compounds. Dedicated development suites are used for small-scale lab encapsulation for feasibility assessments, stability data and final formulation selection.

We maintain additional LFHC centers of excellence for pharmaceutical applications in France (Colmar and Ploermel). Dedicated LFHC design, development and manufacturing facilities for consumer health & nutritional applications are located in Greenwood, South Carolina (USA) and Sagamihara, Japan.

Product design expertise

- Lipid/solvent/co-solvent formulations
- Liquid/semi-solid products
- Colonic delivery using LFHC and specialized coatings
- Dual delivery with specialized capsule-in-capsule technology
- Abuse deterrent formulations

Focus on challenging compounds

- Poorly soluble compounds
- Potent and highly potent compounds
- Cytotoxics, antibiotics, peptides

Manufacturing track record

- Over 25 years of experience in product development and manufacturing
- FDA and MHRA accredited

Versatile capabilities

- Integrated product development and commercial manufacturing on-site
- Specialized isolation capabilities for potent and highly potent compounds
- Multiple production lines with capacity >100MM LFHC units/year
- Pilot and commercial manufacturing
- Non-GMP and GMP capabilities
- Feasibility, stability and clinical batches
- In-line printing capabilities
- Primary and secondary packaging

Learn more about how Lonza’s liquid-fill hard capsule technology can help you address complex formulation challenges.