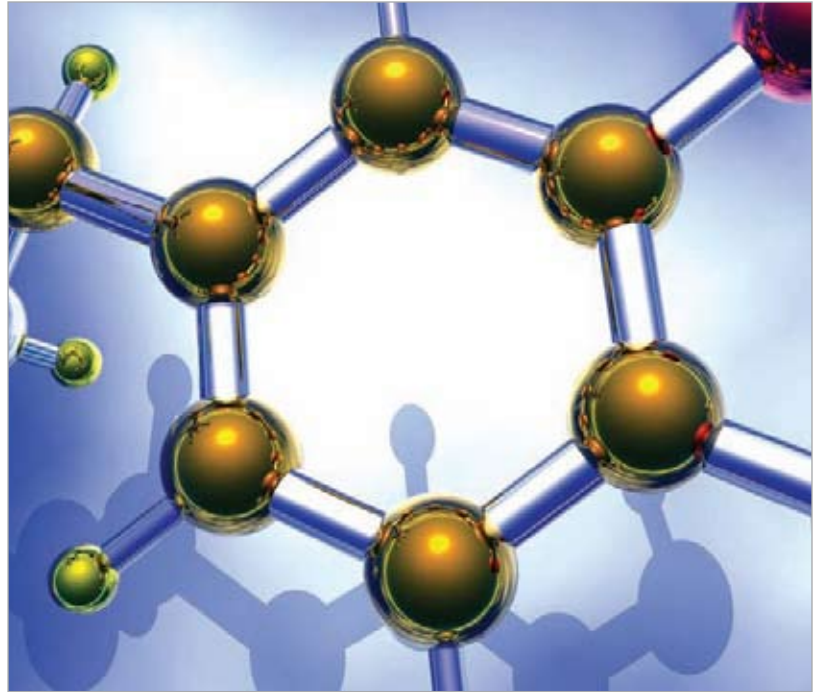


Genzyme Pharmaceuticals

CUSTOM MANUFACTURING

AN INTEGRATED RESOURCE OF CUSTOM MANUFACTURING



CORE COMPETENCIES

CHEMISTRY EXCELLENCE

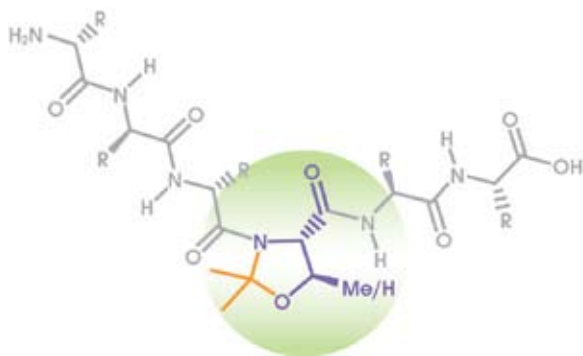
MANUFACTURING EQUIPMENT

ANALYTICAL AND REGULATORY SUPPORT

CORPORATE INFRASTRUCTURE

PEOPLE

CORE COMPETENCIES



Pseudoproline building block

Genzyme Pharmaceuticals provides high-quality products, materials, and services such as Active Pharmaceutical Ingredients (APIs) and specialty fine chemicals through an integrated resource of custom manufacturing to pharmaceutical and biotechnology companies. As a business unit of Genzyme Corporation with a cGMP manufacturing facility in Liestal, Switzerland, our strong chemical expertise, combined with Genzyme's renowned standards of quality, allows us to be a true custom manufacturing partner in a wide range of project areas. Genzyme Pharmaceuticals' core competencies within custom manufacturing center around, but are not limited to, the following:

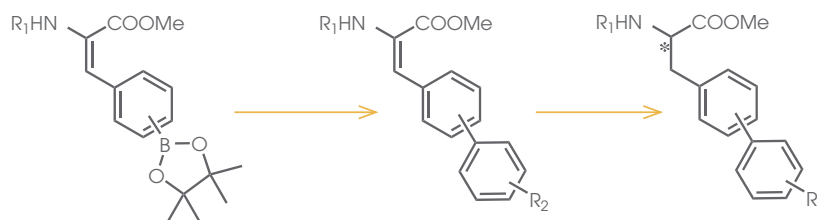
- **SMALL MOLECULES/APIs**
 - Pharmaceuticals
 - Fine chemicals
 - Complex multistep chemistry
- **AMINO ACID DERIVATIVES AND BUILDING BLOCKS FOR PEPTIDE SYNTHESIS**
 - Natural and non-natural amino acids
 - Pseudoproline dipeptide building blocks
 - Dmb protected dipeptide building blocks
- **PEPTIDE SYNTHESIS**
 - Solid phase, solution phase
 - Peptidomimetics, lipopeptides
- **SYNTHETIC PHOSPHOLIPIDS AND OTHER LIPIDS**
 - Hetero and homogeneous, conjugates, helper lipids, sphingolipids, cationic lipids, PEG'ylated derivatives, glycerol lipids
- **POLYMERS**
 - Pharmaceutical applications that require moisture-sensitive handling
- **CARBOHYDRATES**

Among Genzyme Pharmaceuticals' unique core competencies is project and portfolio management. Our project team concept involves members from all functional areas of the division to make early and critical project decisions, followed by immediate implementation of those actions necessary for completion. Team members have direct access to discuss the customer's project status throughout the project timeline, allowing responsibilities to be carried out in a seamless fashion.

CHEMISTRY EXCELLENCE

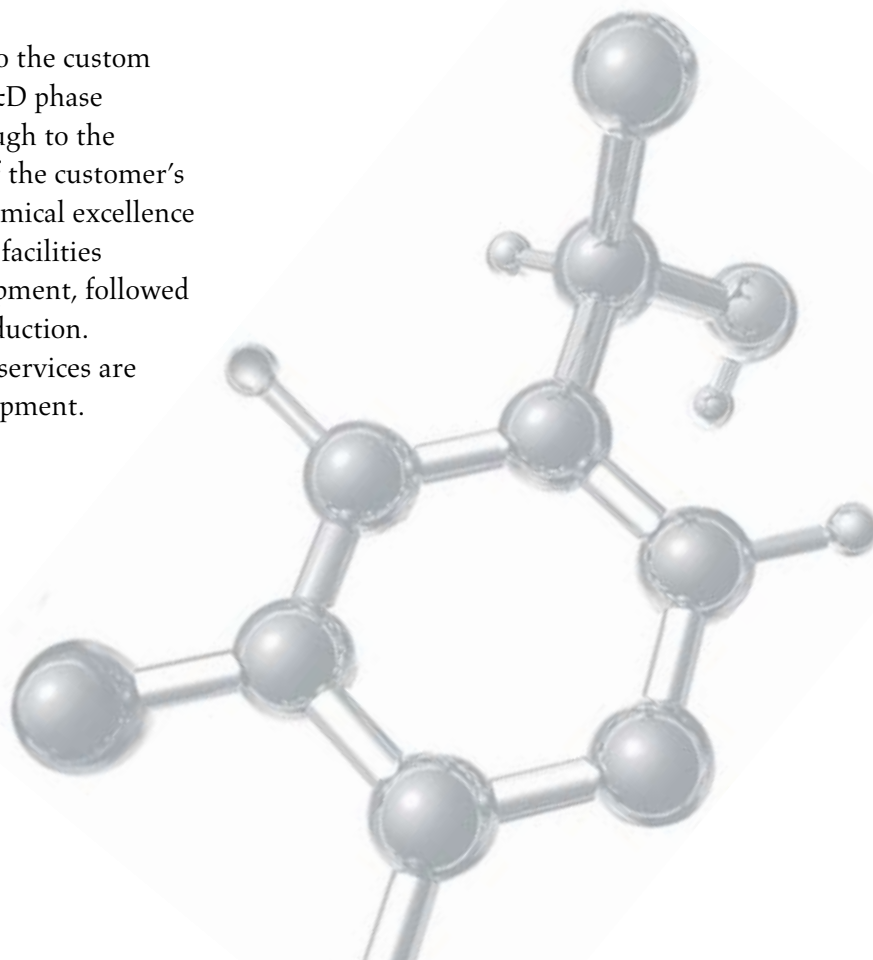
The backbone of any custom manufacturer lies in its technical capabilities. Genzyme Pharmaceuticals' chemistry excellence results from a combination of experience and knowledge in its core competencies and an exceptional command of the fundamental chemistries associated with pharmaceutical and fine chemical products. Included in this group are the following:

- ACETYLATION
- ACYLATION
- ENANTIOSELECTIVE SYNTHESIS
- CATALYTIC HYDROGENATION
(homogeneous, heterogeneous)
- SUZUKI COUPLING
- SHARPLESS EPOXIDATION
- GRIGNARD REACTION
- MITSUNOBU REACTION
- ORGANOMETALLIC REACTIONS
- PHOSPHORYLATION
- POLYMERISATION
- OXIDATION (SWERN/TEMPO)
- WITTIG REACTION

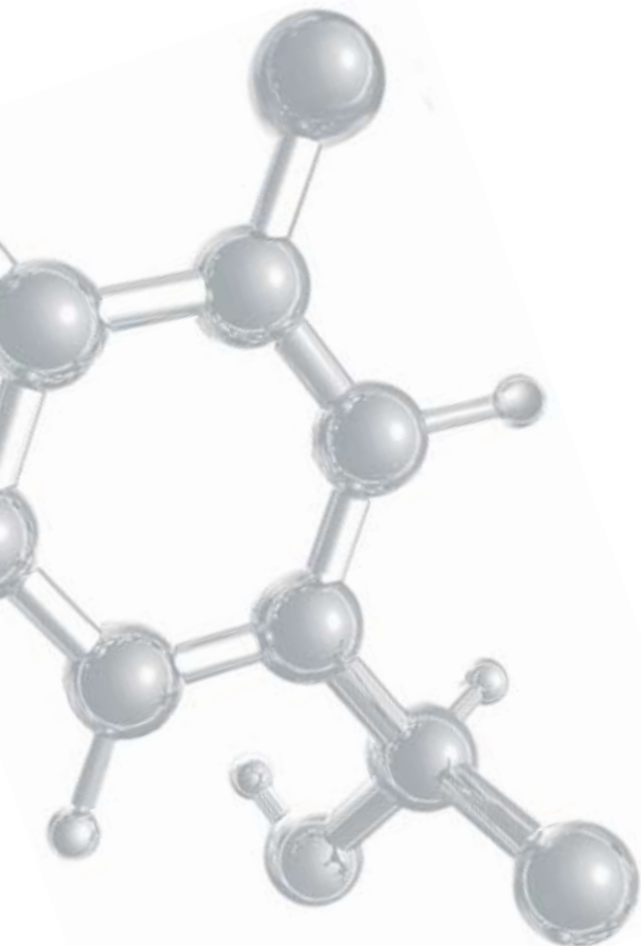


Suzuki coupling followed by asymmetric hydrogenation

Genzyme Pharmaceuticals' approach to the custom manufacturing market starts at the R&D phase of product concept and continues through to the development and commercialization of the customer's drug product or fine chemical. Our chemical excellence therefore extends to R&D and kilo lab facilities to support early stage chemical development, followed by larger scale GMP or non-GMP production. Appropriate analytical and regulatory services are offered throughout all stages of development.



MANUFACTURING EQUIPMENT



Manufacturing equipment is a keystone to our quality. While many custom manufacturers boast of large capacity, Genzyme Pharmaceuticals prides itself on the flexibility and adaptability of its equipment to suit the short and long term needs of developing complex chemicals. Production capabilities range from small kilo to ton capacity, providing optimized value, cost considerations, and supply chain management for each customer's position in the commercialization process.

The following equipment is currently utilized in our Liestal facility:

■ GENERAL MANUFACTURING

For reactions between -100°C and $+160^{\circ}\text{C}$:

- From 60 to 2,500 liters
- From 25 to 160 liters in a Class 100,000 (ISO class 8) clean room

For reactions up to 25 bar pressure:

- 1,000 liter glass-lined hydrogenators
- Hastelloy hydrogenators

For reactions between -100°C and $+250^{\circ}\text{C}$:

- Larger volumes available through manufacturing partner

■ SOLID-PHASE PEPTIDE SYNTHESIS

Up to 1,000 liter volume

■ CHROMATOGRAPHY

200 to 300 liter flash chromatography column (glass)

■ CLASSIFIED CLEAN ROOMS

Class 100,000 (ISO class 8) and 10,000 (ISO class 7) clean rooms

Class 100 (ISO class 5) laminar air flow cabinets

■ LYOPHILIZATION

Lyophilizer for up to 25 kg of purified peptide solution in a Class 10,000 (ISO class 7) clean room

Various vacuum lyophilizers (for intermediates only) in a Class 100,000 (ISO class 8) clean room and in controlled rooms

■ OTHER DRYERS IN A CLASS 100,000 (ISO CLASS 8) CLEAN ROOM

Up to 1,000 liter stainless steel or enamel-coated vacuum dryer

Up to 1,000 liter plate, cone, stirring, filter dryers

■ HPLC PURIFICATION (CLOSED HANDLING) IN A DEDICATED ROOM:

Preparative HPLC columns of various sizes available
Up to 90cm (ht.) x 15cm (dia.)



Ultimately, successful commercialization of a regulated pharmaceutical product is directly proportional to the level of required analytical and regulatory support it receives. Here, Genzyme Pharmaceuticals stands above the competition with trained professionals who can tap into the resources of Genzyme Corporation while adhering to the highest possible regulatory standards. We offer the following analytical and regulatory services at all stages of product development:

■ **GMP CERTIFICATE**

Licensed to produce and distribute APIs and pharmaceutical excipients

Licensed to do contract analysis for pharmaceutical products (raw materials, APIs, and finished dosage forms)

■ **INDEPENDENT QUALITY CONTROL AND ASSURANCE**

■ **INTERNALLY AUDITED BY CORPORATE QUALITY ORGANIZATION**

■ **FDA INSPECTED PLANT FOR API AND QC LABORATORY**

■ **SUPPLY CHAIN MANAGEMENT**

Continuous optimization and improvement of the supply chain throughout the project life cycle

■ **FULL ANALYTICAL SERVICES**

Analytical methods

- Method development and qualification
- Method validation

Characterization services

- Structure identification
- Primary and working reference standard qualification
- Impurity characterization and reference material qualification

Stability studies

- Forced degradation studies
- Investigational and formal ICH stability studies

■ **CLEANING METHOD DEVELOPMENT AND VALIDATION**

ANALYTICAL AND REGULATORY SUPPORT

■ **FULL REGULATORY SERVICE**

Filing and maintenance of Drug Master Files (DMFs in USA, Europe, Japan, Canada, etc)

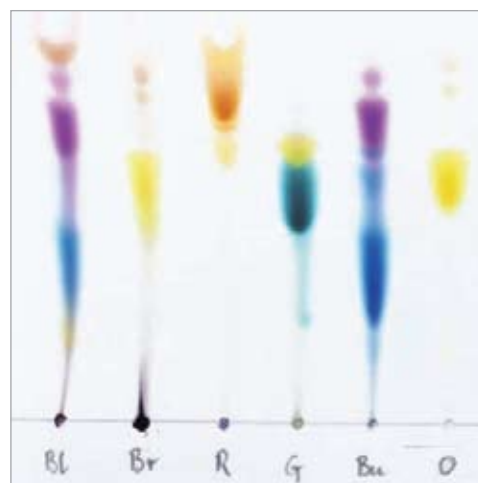
CMC quality module documentation in CTD format suitable for the submission of IND, IMPD, NDA, and MAA dossiers

Shorter time to submission by early involvement of regulatory affairs

Experienced, on-site RA team ensuring regulatory compliance

Proactive discussions of CMC development and regulatory status

The benefit of Genzyme's experience with world-wide regulatory authorities



CORPORATE INFRASTRUCTURE

As a business unit of Genzyme Corporation, Genzyme Pharmaceuticals' corporate infrastructure allows for the autonomy of a distinct business within one of the world's leading biotechnology companies. We pride ourselves on integrating this resource with skilled people, a strong foundation in chemistry, and a state-of-the-art facility to meet the highest standards of quality for your custom manufacturing needs.

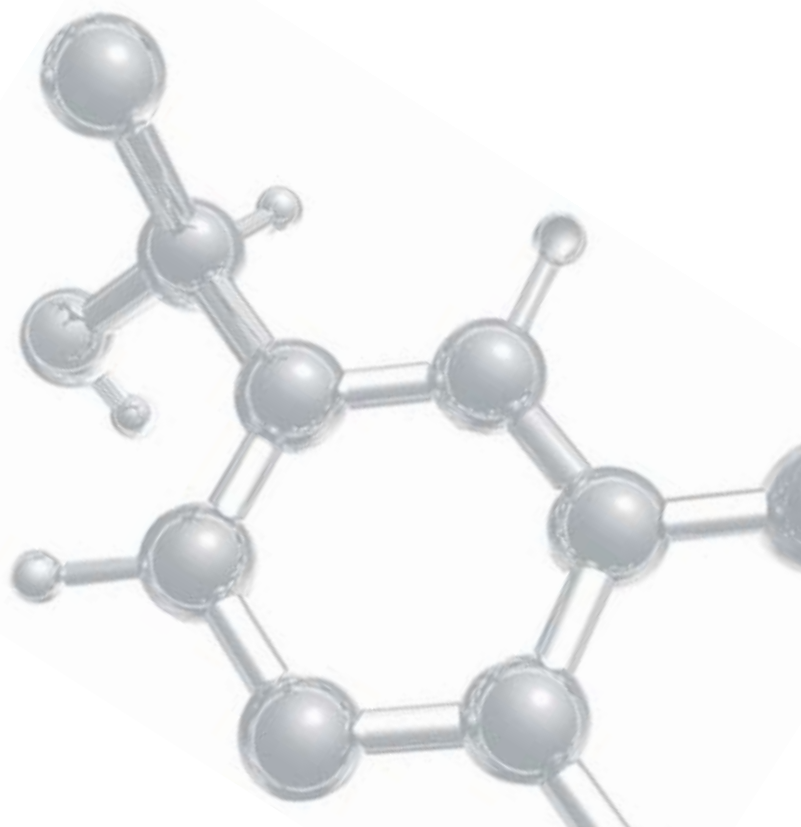
With a cGMP manufacturing facility located in Liestal, Switzerland, just 15 kilometers from Basel and less than 80 from Zurich, our custom manufactured products include registered inter-mediate, APIs, specialty chemicals, and materials used as liposomes and solid lipid nanoparticles in delivering the active drug substance itself.



Genzyme Center



Liestal facility

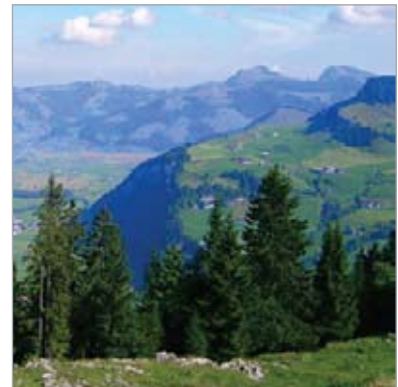


PEOPLE

The Rhine valley region of Switzerland boasts a large number of highly educated, world-renowned scientists and engineers in the areas of chemistry and biotechnology. Genzyme Pharmaceuticals' Liestal facility draws upon its specialized locale by employing multi-cultural, multi-lingual professionals with diverse scientific backgrounds and expertise in pharmaceutical product manufacturing.

With 25% of the staff having PhDs and MSs in the chemical sciences, and close to 20% of the staff being involved in QA and QC, the Liestal facility efficiently orchestrates all relevant business functions such as manufacturing and quality, R&D, sales, and operations support. We are proud of this unique feature, which ensures a goal-oriented project management system.

In addition to the Liestal personnel, the division retains a sales and marketing group at the global headquarters of Genzyme Corporation in Cambridge, MA. This creates a unique divisional structure within Genzyme whereby the Pharmaceuticals business unit offers the focus and flexibility of a stand-alone company, yet is supported by the stability, resources, and confidence of a premier global biotechnology corporation.



Land around Liestal, Switzerland



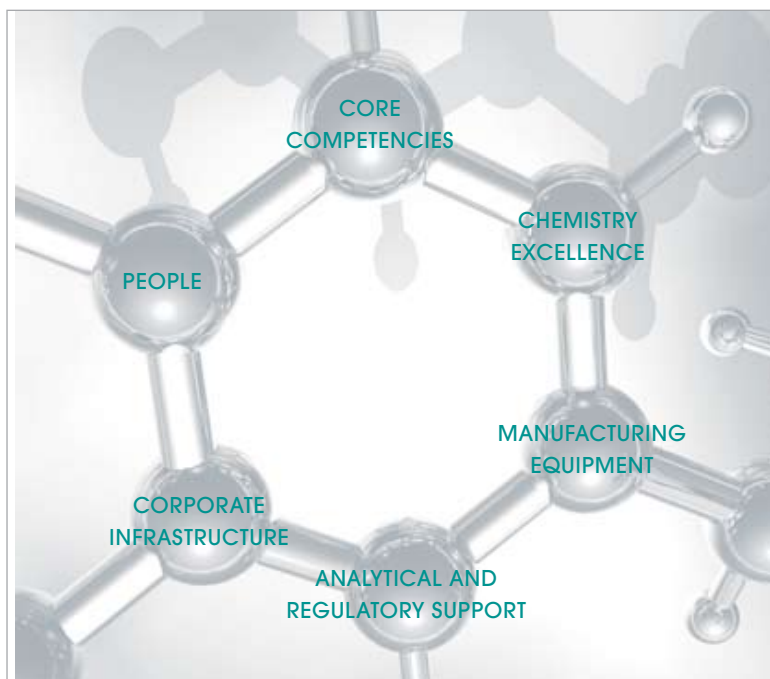
Liestal Employees

AN INTEGRATED RESOURCE OF CUSTOM MANUFACTURING

Genzyme Pharmaceuticals offers pharmaceutical and biotechnology companies unequaled value in custom manufacturing complex organic pharmaceutical materials and drug products. Our success is built around a core of highly trained people, surrounded by a state-of-the-art cGMP facility, reinforced with a history of chemistry excellence, and integrated into a premier biotechnology company.

We extend this resource into the production of other non-pharmaceutical specialty and fine chemicals, resulting in a world-class custom manufacturing organization.

We look forward to efficiently providing our customers the quality custom-manufactured materials and services needed to meet the business and health challenges of the 21st century.



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