



BIOSYNTH<sup>®</sup>

# Complex Chemical GMP Services

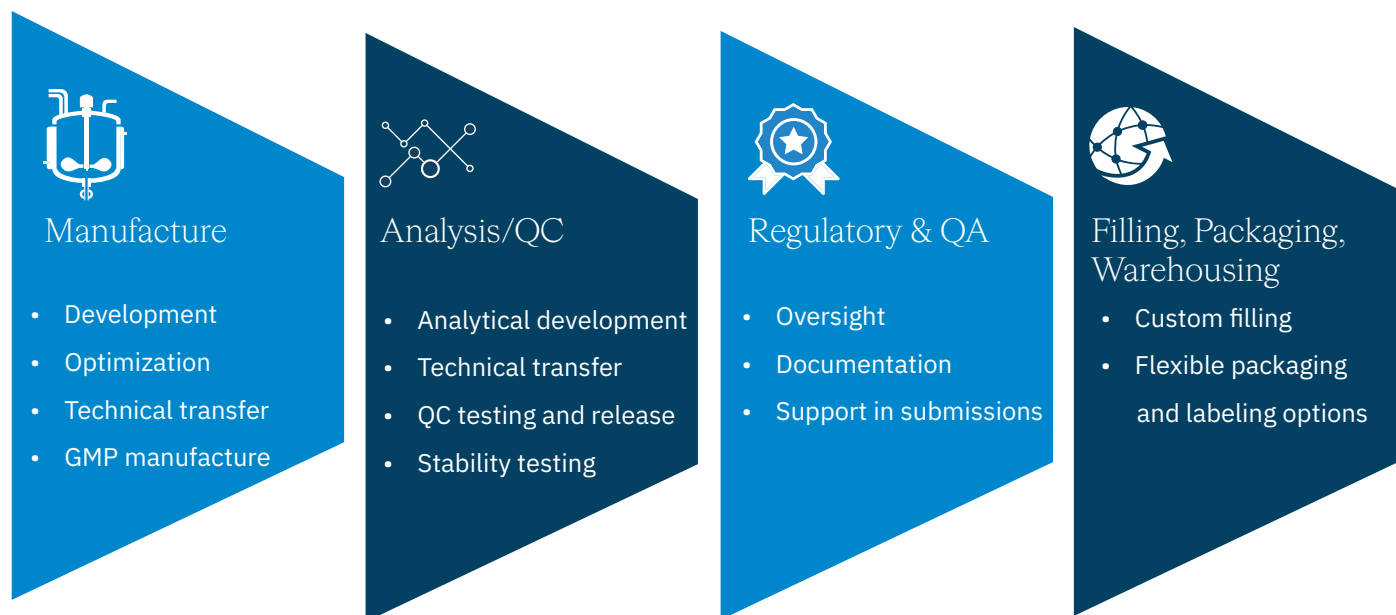
**End-to-End Manufacturing  
Across A Range of Sites**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# GMP Manufacturing Services

With our state-of-the-art GMP facility and specialist complex chemistry expertise we are uniquely positioned to support you with the development and manufacture of your product to GMP.

At Biosynth, we understand that your needs may change, and we work as a partner with you. Whether this be for your GMP development or supporting scale up and validation we can undertake the whole service or the separate parts you need. We have experience in manufacturing and developing for a range of applications, including APIs, foodstuffs, excipients, process materials, adjuvants and more.



## GMP Manufacturing Facility

Our state-of-the-art GMP plant in Switzerland performs pilot and production runs at a range of scales up to 100 L as well as small scale API manufacturing. Biosynth has a flexible facility that can be adapted to different process designs and scales, which enables clinical batches and bulk production by the same experienced team. The plant is GMP, PMDA and ISO 9001:2015 compliant. In our site in Berlin, we specialize in the synthesis and GMP-compliant manufacturing of amphiphilic polymers.

Our warehouse and processing capabilities and qualifications allow us to store, package, and ship the GMP products we manufacture.

### Key Features of our GMP Facility:

- GMP Class D (ISO 8) cleanroom facility for organic synthesis of APIs
- Chemical hoods for organic synthesis of small-scale amounts (mg to several 100 g batch size)
- GMP plant for production (1 – 10 kg batch size, 100 L maximum)
- 40 L and 80 L pressure filter for Hydrogenation reactors up to 50 L
- Freeze drying capability of up to 60 L

## Expertise

The GMP team at Biosynth are experts in complex chemistry, in particular the synthesis of carbohydrates and nucleosides, with unique skills in optimizing and troubleshooting production and analysis, as well as broader chemistry expertise. We also offer customer-specific solutions for the synthesis and GMP-compliant manufacturing of amphiphilic polymers, serving both drug delivery and non-medicinal applications.



## How We Operate

### Dynamic and Flexible Partners

The route from your needs to a cGMP product involves strategic and tactical considerations. We work as your partner to deliver what you need when you need it, being ready for the next stage or phase when business requirements, budget or data demands allow it.

### High Quality Analysis

Our analytical capability is a key part of our service, with in-process control (IPC) and final product testing. GMP batch release testing of each API is performed in our Swiss quality control laboratory. We work with you to transfer in, develop, qualify and validate methods as appropriate for your stage of development.

### Regulatory Expertise and Guidance

We are experienced with the development and validation of many API processes that have been through various stages of regulatory approval. We are proud to have an excellent inspection record and seek to continually improve. We offer a regulatory filing assistance service, whether it is for preparation or review of CMC or DMF filings.

For more information on our GMP Services visit [www.biosynth.com/complex-chemicals](http://www.biosynth.com/complex-chemicals).

# BTB

## Global Reach



## Global locations

Discover all our locations at [www.biosynth.com/worldwide-locations](http://www.biosynth.com/worldwide-locations)

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Switzerland	India
United Kingdom	South Korea
Ireland	Japan
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China	Germany

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## About Biosynth

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals - where Chemistry meets Biology, Products meet Services and Innovation meets Quality, Biosynth is at the Edge of Innovation. With an unrivaled research product portfolio of over a million products and end to end manufacturing services, we are science led and customer focused to solve problems, taking pride in delivering products and projects that others cannot. Our expertise and capability runs across Complex Chemicals, Peptides and Key Biologics all from one trusted partner.

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# Complex Chemical Large Scale Manufacturing

**End-to-End Manufacturing  
Across a Range of Sites**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Large Scale Manufacturing, Service for Your Scale and Speed

Whether you are starting at large scale or moving on from our custom synthesis and smaller scale production, at Biosynth we have a range of facilities to manufacture, fill and store high quality chemical products at scales up to 10 Metric Tonnes.

## Flexible service offering:

Transfer in your existing manufacturing and analytical methods ready for a large scale manufacturing batch or scale up an existing manufacturing methodology.

## Expertise and Specialties

- Carbohydrate-based drugs
- Carbohydrate-based detergents
- Antiviral nucleoside analogs
- Substrates for detection of enzymatic activity
- Food and environmental analytical compounds
- Cosmetic ingredients
- Nutraceutical ingredients
- Amphiphilic polymers for drug delivery



## Manufacturing in Europe

We have two manufacturing sites in Europe for larger scale production at ISO 9001:2015, which are based in Staad, Switzerland, and Bratislava, Slovakia. Flexible range of reactors sizes from 60 L up to 3000 L and equipped with cutting edge instrumentation and highly qualified scientists to support our production and QC processes.

In Switzerland, we also have a co-located GMP pilot plant for medium size production (1 - 10 kg batch size) as well as research laboratories for route scouting and development. This is in addition to our excellent facilities in the UK for process development and custom synthesis. In our site in Berlin, we perform manufacturing of polymers and small molecules (GMP and non-GMP), as well as bioconjugates (also GMP and non-GMP).



# Manufacturing in Asia

We have a range of large-scale manufacturing options in Asia, including a flexibility service through trusted partnerships. We have an outstanding and broad network of reliable manufacturing partners across China and India.

With a focus on operational excellence and outstanding quality in our manufacturing services, these partnerships are run by transparency. We actively participate in all production stages and quality management systems on site to ensure optimum and consistent quality of your product. Our partner facilities comply with local regulations and market requirements, are accredited with GMP and/or inspected by FDA. Depending on your needs, we will select the most appropriate manufacturing partner.

In addition to the partnered services, Biosynth have our own large-scale chemical manufacturing site in China. Our multi-purpose modern plant in Jinan, China is part of the Jinan Shangbo Pharmaceutical Co Joint Venture between Biosynth Group and Shengquan Group.



This large-scale manufacturing plant is multi-purpose with vessels from 250L to 3000L.

It has a flexible layout with a pilot plant, clean finishing area and separate chemical synthesis and pharma halls. These are built and equipped to produce high quality products with excellent processes and robust analytical assessment. This allows us a reproducible and reliable supply of our customers' large-scale products, along with our own in-house products. The plant is constructed to meet EU regulations, including Directive 2011/62/EU, US FDA, CFDA and is compliant with ISO9001:2015 quality standards.



**For more information visit [www.biosynth.com/complex-chemicals](http://www.biosynth.com/complex-chemicals)**

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## Global Reach



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# Manufacturing Services

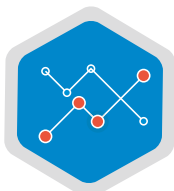
## From the First Idea to the Finished Product

From the first idea to the finished product, we help our customers to manage costs, reduce infrastructure investment and compress time to market by providing integrated contract development and manufacturing services.



### MANUFACTURING SERVICES

Full Service from Route Scouting, Optimization and Custom Synthesis to Large Scale or GMP Manufacture.



### ANALYTICAL SERVICES

Experts in Method Development, In-Process and QC Testing, Method Validation and Stability Testing.



### FINISHING & DISTRIBUTION

Fully Flexible Options for Filling and Packaging, with Global Warehousing and Logistics Management.

Biosynth are experts in the manufacture and supply of complex chemicals and reagents to the pharma, vaccine and diagnostics industries. With research and development laboratories, manufacturing, warehousing and offices across the globe, we develop our own innovative products and custom manufacture for our customers at small scale, large scale, and to GMP. At Biosynth, we relish working on challenging projects and solving the problems that others cannot.



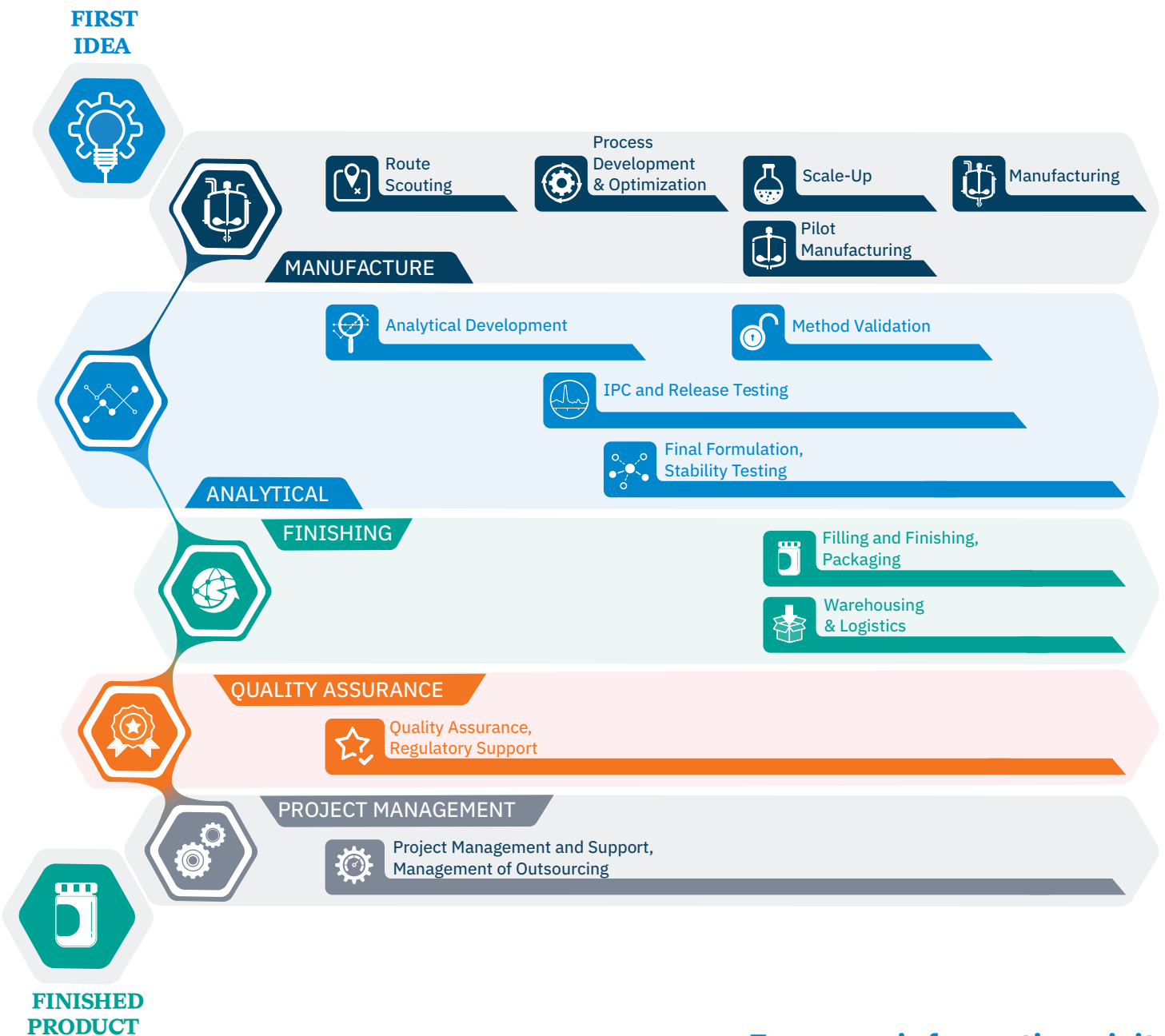
### Areas of Specialty

- Carbohydrate Building Blocks & Derivatives
- Oligosaccharide Synthesis
- Nucleosides, Dinucleotides & Analogs
- Heterocyclic Chemistry
- Fluorination, Phosphorylation & Sulfation Chemistry
- Novel Enzyme Substrates
- Natural Product Synthesis
- Impurities and Metabolites
- Protein Conjugation, Biotin and Click Linkers
- High Purity Complex Products
- Synthetic Route Development
- Medicinal Chemistry
- Regulated Materials
- Polymer Chemistry (Functionalized Amphiphilic Polymers)
- Biocatalysis

# How We Work

At Biosynth, we work as your partner in developing and manufacturing your product, be it a pharmaceutical or cosmetic ingredient or API. We work with you to understand your needs and have a flexible and dynamic approach. We are ready for the next stage or phase when business requirements, budget or data demands allow it.

You can choose the right package for you from our service offering. This ranges from the transfer in of existing manufacturing and analytical methods ready for GMP manufacturing to a full program of route scouting, optimization and analytical development. Thanks to our integrated services, your project will transition seamlessly from either of our discovery labs in the UK or Switzerland to the Swiss GMP facility, or to another worldwide location for mid-scale or large scale manufacturing at ISO 9001:2015.



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# LB

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# Key Biologics Services Overview

Reagents for *in vitro* Diagnostics

Custom Enzymes

Custom Antibodies

Proteins and Antigens

Bioconjugation

Epitope Mapping

# Biologics Services from Biosynth

We have an extensive range of biologics products and custom services to deliver the highest quality tools to the research, diagnostic and pharma industries. From antibodies and antigens, to bioconjugation services, enzymes and Epitope Mapping, we can guarantee to meet our customer's needs.

## Antibodies and Antigens for *in-vitro* Diagnostics

With years of expertise in the development of proteins and antibodies for new and emerging diseases, we provide high quality raw materials to the in vitro diagnostic industry and research laboratories.

We supply the best-in-class tools to both clinical and veterinary diagnostics. The products and custom services include polyclonal and monoclonal antibodies, antisera, plasma, recombinant and native antigens, immunoglobulins, research kits and biological reagents.

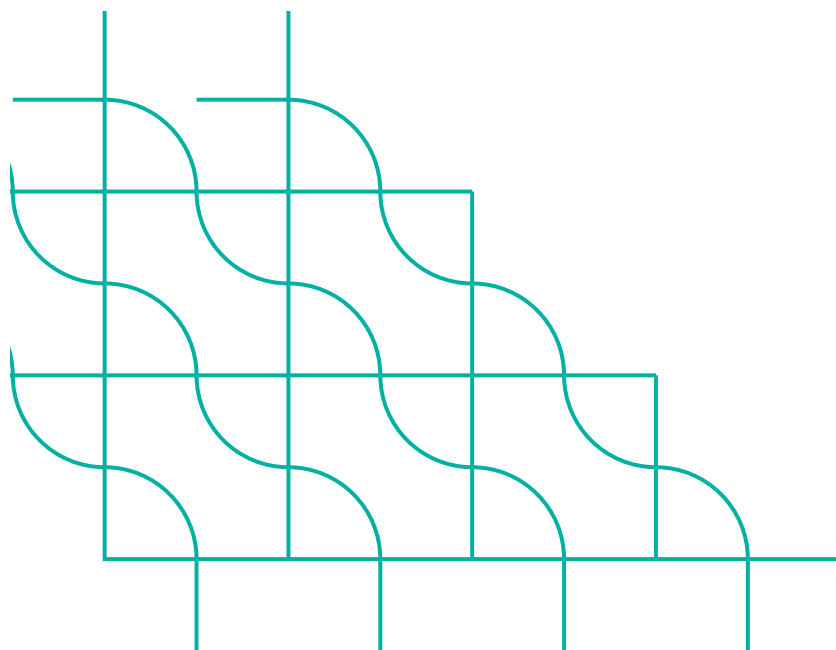
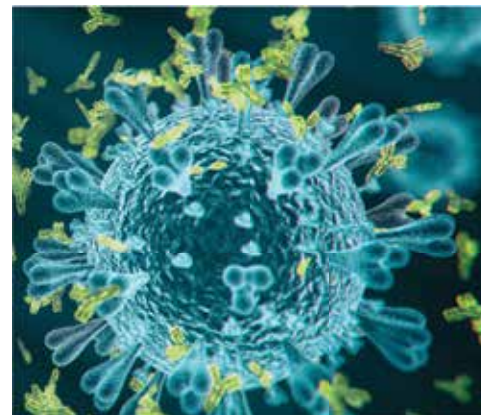
- Custom manufacture of new recombinant antigens
- Routine manufacture of bulk antigens and antibodies under ISO 13485:2016 conditions
- Full raw material menu for chemiluminescence platforms
- Largest provider of bulk disease state plasma for controls in Europe



## Custom Antibodies

We offer complete polyclonal and monoclonal antibody packages with antigen design, custom peptide synthesis, conjugation, immunizations, affinity purification, and more. Having production facilities in both the UK and US extends our global outreach to customers.

We specialize in making highly specific antibodies to multiple types of post-translational modifications and we can even use special protocols to make clean, specific antibodies to tryptic fragment peptides for use in iMRM.

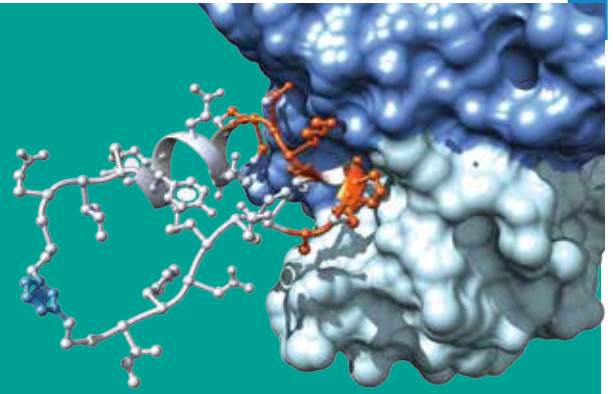


For more information on our antibody and other biologics services, including epitope mapping and antigen antibody development, visit [www.biosynth.com/biologics](http://www.biosynth.com/biologics)

## Epitope Mapping Experts

Epitope Mapping is instrumental to therapeutic antibody development and plays a key role in the functional understanding and selection of antibodies, IP protection and FDA/EMA approval.

Biosynth's peptide-based epitope mapping combined with our proprietary CLIPS™ technology creates a unique platform to define linear, conformational and discontinuous epitopes and multimeric proteins. Our platform permits screening of a series of antibodies or sera on a single array, making linear epitope mapping a fast and cost-effective option for best candidate selection, antibody characterization, antibody profiling and further development.



## Enzyme Services

High-performance enzyme solutions for custom applications in biopharma, biotech and applied markets. Biosynth lead the way in providing customized services spanning the whole process of enzyme development and production. From bioprocess development, right up to industrial-scale manufacture we have pioneering technologies to generate novel enzyme based biocatalysts.

Our experts have established a state-of-the-art catalog of high performing enzymes. You can now select panels of key enzymes for individual purchase and large-scale manufacturing from our enzyme screening kits.



## Bioconjugation

Biosynth pioneers advanced bioconjugate drugs, conjugate vaccines, and polymer innovations for pharmaceutical needs. Our comprehensive services span from developing tailored PEGylated biomolecules and conjugate vaccines to crafting specialized polymers and activating PEGs, complemented by cutting-edge multimerization technologies, empowering advancements in drug delivery and biomolecule analysis.



Antibody Drug Conjugate (ADC)



PEGylated protein



Conjugate Vaccine



Protein Multimers



## Global Reach



### Global locations

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BIOSYNTH®

# Bioconjugation Services

**Custom Conjugate Synthesis**

**GMP Manufacturing**

**Analytical Development and Release**

**Polymer Chemistry**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Conjugation of Biopharmaceuticals

We offer customized conjugation solutions to alter or improve the pharmacological properties of biopharmaceuticals. Bioconjugation is widely used in the pharmaceutical industry to increase tolerance, potency, half-life, or solubility of biopharmaceuticals. Other applications for bioconjugates are targeted and immune therapy.



## Expertise and Specialties

- Process development and scale-up.
- Manufacturing of bioconjugates for in-vitro applications, animal studies and clinical trials.
- Extensive know-how in PEGylation and conjugated vaccines (bulk drug substances).
- GMP production of drug delivery polymers and bioconjugates.
- Development, qualification and validation of analytical methods

## Manufacturing Capabilities

Biosynth manufactures GMP and non-GMP bioconjugates, polymers and functionalized linkers for use in conjugation. We bring more than 20 years of excellence in the field of bioconjugation, pharmaceutical development and polymer chemistry. Together with our top cutting-edge facilities and comprehensive development services, we can help you to achieve your goals efficiently and effectively. We provide versatility and scalability for projects of various sizes thanks to our 10 and 60 L chemical reactors. The GMP Class D clean room ensures a controlled environment to deliver the utmost product quality.

## Products and Services

Biosynth's wide array of products and services are tailored to your specific requirements. We offer multi-step syntheses from mg to kg scale for R&D and GMP production.

- Bioconjugates (GMP and non-GMP).
- Polymers and small molecules (GMP and non-GMP).
- Analytical services includes batch release (GMP).
- Bioconjugates and excipients for several diagnostic applications.

At Biosynth, we provide a complete range of development services to guide your project through to the clinical phase. From optimization and development to validation of analytical methods to meet rigorous standards.



## Bioconjugate Expertise

Biosynth has a proven track record in the development of bioconjugates, with extensive experience in chemistry and biologics to carry on modification of biologics with polymers/PEGs or small molecule drugs. We are familiar with all varieties of bioconjugation methods, including PEGylation and glycoconjugation, as well as with small molecule or peptide coupling. We offer our services at any stage of bioconjugate development, ranging from first feasibility studies, through process and analytical method development, to the manufacturing of investigational medicinal products (IMP) for first-in-man studies.

## Supply of GMP Small Molecules and Peptide NCE's

No need to change suppliers for all of your components- we can provide the full service offering for bioconjugates. Biosynth manufactures peptide NCEs from R&D commercial supply along with GMP small molecules.

- Combining smart peptide science and flexible GMP manufacturing capabilities. We offer GMP-compliant synthesis services for peptide NCEs and commercial peptides.
- Manufacturing capabilities for batch sizes for small molecules and polymers range from 100 g to kg. Bioconjugates can be manufactured in gram to 100 g batches.



## Customized polymers for:

- Hydrogels
- Nanoparticles
- Drug carriers
- Excipients
- Hyperbranched polyglycerols
- PEG-poly amino acid polymers
- Customized PEG derivatives
- Functionalized polyimines
- Hydrophilic multi-arm polymers

For more information visit  
[www.biosynth.com/bioconjugation](http://www.biosynth.com/bioconjugation)



## Global Reach



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A microscopic image showing various biological structures, including what appear to be antibodies (Y-shaped structures) and cells, rendered in shades of green and blue against a dark background. The structures are scattered across the frame, with some appearing more prominent than others.

BIOSYNTH®

# Custom Antibody Production

**Immunogen Design**

**Polyclonal**

**Monoclonal**

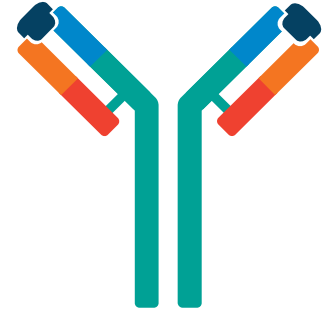
Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Custom Antibodies from Biosynth

With over two decades of peptide synthesis and antibody development experience, Biosynth offers complete antibody packages with antigen design, custom peptide synthesis, conjugation, immunizations, affinity purification, and more. Our antibody services are backed by unmatched customer service and technical support, and our contract facilities are fully accredited.

## Our Design Philosophy

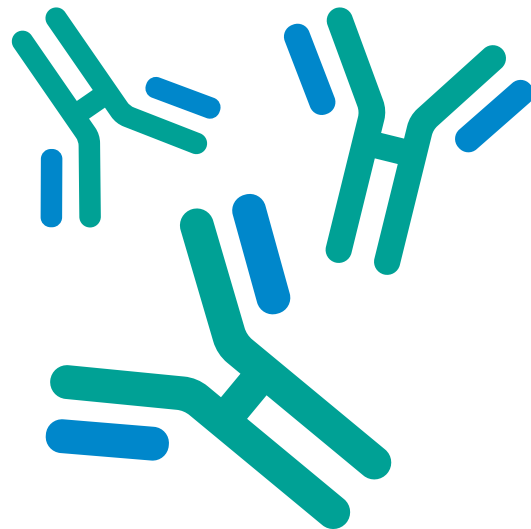
More than anything else, the initial design of a peptide antigen has the greatest influence on the ultimate success of any project. Our methods for performing this have been consistently recognized as the most thorough in the industry. We perform a complete bioinformatics study of each target protein that includes a review of specificity, antigenicity, surface accessibility, protein mimicry, binding events, and the potential presence of post-translational modifications, all of which can play a part in how well an antibody will be able to bind your protein of interest.



## Custom Monoclonal Antibodies

We offer custom monoclonal antibody production. For mouse monoclonals, this service is broken down into the typical multi-phase development strategy for flexibility purposes.

- Phase I: Immunization
- Phase II: Fusion / Initial Selection
- Phase III: Sub-cloning
- Phase IV: Production



We currently offer both mouse monoclonal and rabbit monoclonal antibody development programs, using B-cell cloning.  
Contact us to find out more

# Custom Polyclonal Antibodies

We offer a variety of polyclonal antibody production packages, with flexible options:

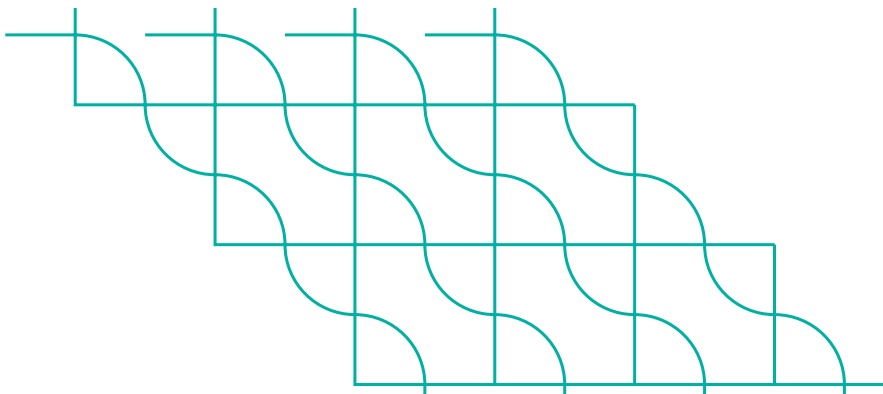
- Rabbits are the industry standard for polyclonal antibody production, but we can also offer this service in several other species (chicken, goat, guinea pig, hamster, among others - contact us for a complete list of options).
- We specialize in making highly specific antibodies to multiple types of post-translational modifications, including phosphorylation, methylation, acetylation, cleavage-site, and more.
- If you require a rabbit monoclonal antibody, we can proceed directly to this from an existing polyclonal via B-cell sorting.
- We use special protocols to make clean, specific antibodies to tryptic fragment peptides.
- Customization of our existing protocols is possible (number of animals, length of immunization schedule, etc.). Discuss your project needs with us for a flexible approach.

## Standard Rabbit Package

All of our offerings are based on our Standard Package, which includes:

- Antigen design/ Bioinformatics
- 5 mg uncoupled peptide sent to customer, 4 mg coupled to KLH, 1 mg for ELISA
- Three immunizations of two rabbits (New Zealand White - SPF)
- 5 mL pre-immune serum per rabbit
- Two production bleeds (40-50 mL antiserum) per rabbit
- ELISA on 1st production bleed

Most of our customers also add affinity purification, which helps to remove potential background signals across multiple application types..



**For more information on our antibody and other biologics services, including epitope mapping and enzyme development, visit [www.biosynth.com/biologics](http://www.biosynth.com/biologics)**

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# Enzyme Products

**Catalog Enzymes**

**Screening Kits**

**X-Shining<sup>™</sup> Luciferase**

**Beta-lactamases**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Large Collection of Enzymes for Research



Biosynth have a large collection of enzymes for research, pharma, cosmetics and fine chemical applications. You can now select panels of key enzymes for individual purchase and large-scale manufacturing from our enzyme screening kits and our portfolio of catalog enzymes.

## Screening Kits

Our novel enzyme screening kits provide a range of enzyme variants to screen across target substrates and reaction conditions. Target enzyme(s) (hits), can be supplied individually in large quantities up to the multi-kilogram range.

Discover our range of screening kits:

- Nitrile hydratases
- Lipases
- Peroxidases
- Phospholipase D
- Beta-Lactamase

## Nitrile Hydratases

Ecofriendly metalloenzymes for the conversion of nitrile substrates into useful amide products.

## Lipases

More than 50 unique lipases of microbial origin, carefully selected and engineered for applications in the chemical, pharmaceutical and food and feed industry. We even offer kits of reference and immobilized lipases.

## Peroxidases

Developed for high activity, specificity and selectivity Biosynth peroxidases carry out a range of reactions: epoxidation, N-demethylation, halogenations, alcohol/aldehyde oxidation and N- or S-oxidation.

## Phospholipase D

Highly selective, recombinant phospholipase D enzymes with a broad pH range for transphosphatidylations reactions. An excellent candidate for industrial, pharmaceutical and cosmetic synthesis applications.

## Beta-Lactamases

Delivered to you as the LacBuster™-branded optimized formulations. High performing broad range beta-lactamases, recombinantly produced in E. coli with activity towards penicillins, 4th and 5th generation cephalosporins and carbapenems.



## Patent Protected Catalase Enzyme

Add our potent and highly stable catalase enzyme to contact plates to rapidly remove remaining traces of hydrogen peroxide disinfectant. A safer and more reliable solution for environmental monitoring of sterilization in clean rooms, isolators or production facilities.

## X-Shining™ Thermostable Luciferase

Genetically engineered for increased thermostability and storage stability and suitable for any luciferin-luciferase-based assay. Just some of its applications are in ATP tests in hygiene monitoring, drug screenings and bacteria identification in microbial assays.

For the rapid testing of imipenem, cefotaxime and ampicillin antibiotic susceptibility, we have X-Shining™ AST products.

## X-Shining™ all-in-one ATP Assay

A single vial containing an optimized reaction solution for the specific bioluminescent detection of ATP levels. Crucial in the study of cell cultures, biochemical processes and to assess biological contamination and antibiotic efficacy in populations.

## Lipase Suicide Inhibitors

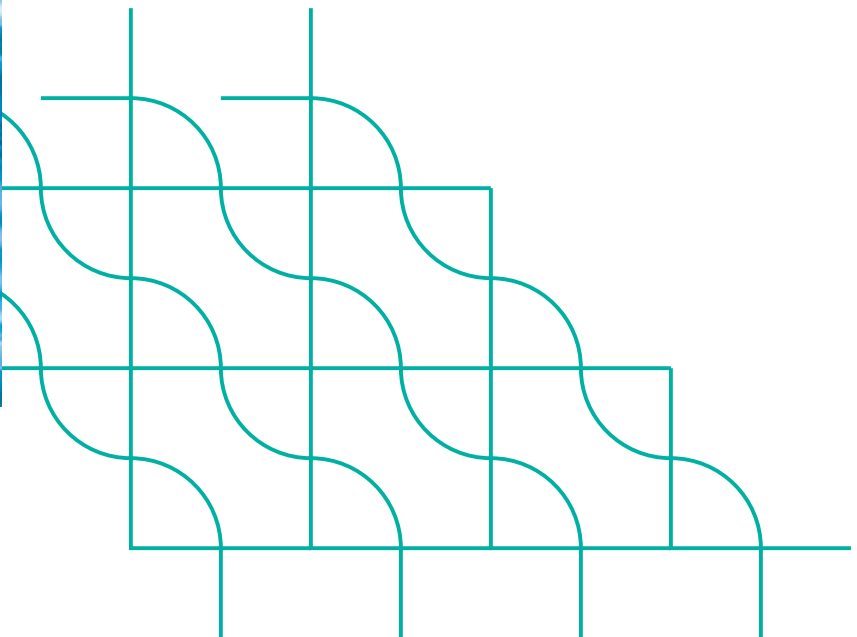
For determining lipase and hydrolase activity, even in complex protein mixtures, use Biosynth's lipase suicide inhibitors. The molar amount of enzyme can be determined by active site titration experiments.

## Also in our Enzyme Library...

Amidases, Isoamylase, T7 RNA Polymerase, Proteinases/Peptidases, Acidic Lipases and Natural Tubulysins and Analogues.

Visit our enzyme product catalog to see our whole range of Hydrolases, Transferases, Lyases, Oxidoreductases and other enzymes.

For more information on our enzyme products, services and technologies visit [www.biosynth.com/biologics/enzymes](http://www.biosynth.com/biologics/enzymes)





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A person wearing a blue lab coat and gloves is holding a petri dish. The petri dish contains a white agar surface with numerous small, white, circular bacterial colonies. The person's face is partially visible in the background, blurred. The overall scene is set against a blue background.

BIOSYNTH<sup>®</sup>

# Enzyme Services and Technologies Overview

**Protein and Enzyme Screening**

**Custom Enzyme and Protein Engineering**

**Bioprocess Development**

**Manufacture and Final Formulation**

**Beta-lactamases**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Enzyme Services and Technologies

We deliver customized services in enzyme development and production to generate novel enzyme based biocatalysts for biopharma, biotech and applied markets. The team cover the whole spectrum of bioprocess establishment up to industrial-scale manufacture of target proteins under ISO9001:2015.

## Enzyme Development Services

We shape our customer's enzyme projects using a selection or the entirety of our enzyme services below. From target enzyme identification to protein and enzyme manufacture, we can guide you through part or the complete lifecycle of your product.

### Target Enzyme Identification

Designing suitable screening assays to identify novel enzymes for your bioconversion reactions is our forte. We can screen candidate enzymes from your own enzyme collection or perform general database or library screening.

### High-throughput Screening

To ensure our enzymes and proteins meet our customer's quality, activity, reaction kinetics and selectivity specifications, we perform in-depth analytical methods under our ISO9001 quality management system:

- Protein analytics
- DSC and High-resolution MS
- Activity analysis with various substrates
- Purity and contaminant analysis

### Protein and Biocatalyst Manufacture

Our novel fermentation processes, downstream processing and tailored formulations can produce proteins and enzymes from a small to large scale. All products are manufactured using ISO9001 process controls. We can even provide compatible buffers for increased stability and activity, filling, labelling and packaging services and can transfer to GMP feasible facilities if required.

### Protein and Enzyme Engineering

Our engineering tool box for customized proteins and enzymes with improved activity, stability and substrate selectivity:

- In Silico Analysis of Protein Structures and Sequences
- Targeted Site Directed and Site Saturation Mutagenesis
- In vivo Recombination
- Gene Shuffling
- Random Mutagenesis

For more information on our enzyme products, services and technologies visit [www.biosynth.com/biologics/enzymes](http://www.biosynth.com/biologics/enzymes)



## Bioprocess Development, Biocatalysis and Biofermentation

We optimize the most efficient, renewable microbial fermentation methods and bioprocesses to produce your specific protein, enzyme, recombinant protein or small molecule.

- Cloning and Expression - (Yeast, Bacteria and Fungi)
- Fermentation Optimization
- Downstream Processing and Purification
- Final Formulation and Professional Upscale

Customers can choose from: spray drying, lyophilization and immobilization. A range of professional upscaling options from 1L to 1000L bioreactors, as well as up to 150m3 with our partners in Europe, are available.

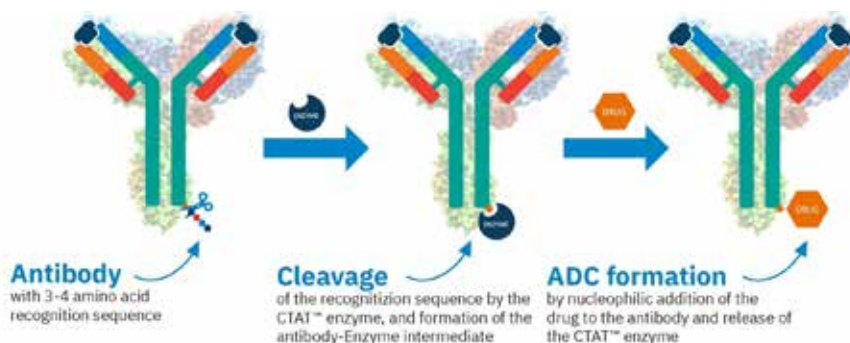


## Enzyme Technology Services

State-of-the-art, natural process technology for a sustainable path for your project progression, offering economic and environmental advantages.

### Enzymatic Protein Drug Conjugation

Our patented linker technology CTAT™, conjugates the chosen payload molecule to a specific site on an antibody, antibody fragment or protein. For the development of antibody-drug conjugates, we are adaptable to your required payload molecule, including drug molecules, beads, matrices or dyes.



### Environmental Monitoring

- High performing LacBuster™ beta-lactamases for monitoring microbe growth in sterile facilities
- Novel patented enzyme technology Catalase, which neutralizes hydrogen peroxide in liquid or solid media.

### Immobilization

Depending on your specific requirements we can immobilize your biocatalyst using either:

- Hydrophobic resins for adsorption of the respective enzyme
- Chemically activated resins for covalent immobilization

We offer a wide range of optimal immobilized biocatalyst solutions.



## Global Reach



### Global locations

Discover all our locations at [www.biosynth.com/worldwide-locations](http://www.biosynth.com/worldwide-locations)

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Switzerland	India
United Kingdom	South Korea
Ireland	Japan
Slovakia	Austria
United States	Netherlands
China	Germany

### About Biosynth

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals - where Chemistry meets Biology, Products meet Services and Innovation meets Quality, Biosynth is at the Edge of Innovation. With an unrivaled research product portfolio of over a million products and end to end manufacturing services, we are science led and customer focused to solve problems, taking pride in delivering products and projects that others cannot. Our expertise and capability runs across Complex Chemicals, Peptides and Key Biologics all from one trusted partner.

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BIOSYNTH®

# Epitope Mapping

**CLIPS™ Conformational Mapping**

**Single-residue Resolution**

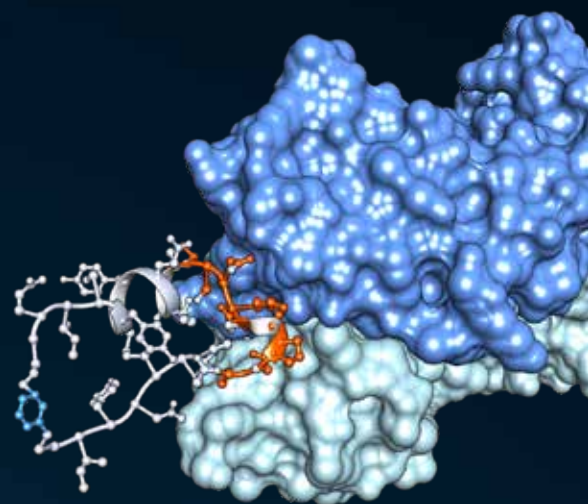
**Peptide Lead Identification and**

**Optimization**

**Full Antibodies, Fragments, Nanobodies,**

**and Tagged Proteins**

**IP Protection, FDA/EMA Approval**

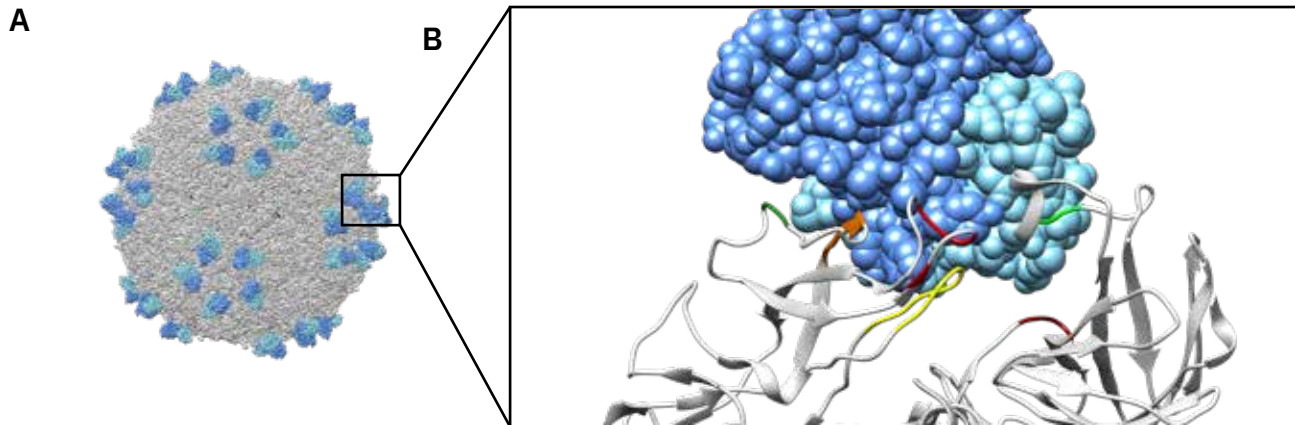


Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Epitope Mapping: Instrumental in Therapeutic Antibody and Diagnostic Assay Development

Epitope mapping is a pioneering technology that allows for the identification of the structure and sequence of an epitope. It enables:

- Comparison of antibodies with a similar epitope
- Different antibodies to be classified into separate binding bins
- Essential amino acid positions within an epitope to be identified
- Understanding of the amino acid requirements in cross-species or multi-strain reactivity



*Anti-viral immune responses can raise specific antibodies against the foreign antigen. Such antibodies can be developed into specific reagents for blocking viral infections. (A) EM structure showing monoclonal antibody Fab fragments binding to the ZIKA virion (Long, 2019; pdb: 6MID). Heavy and light chains are colored in dark and light blue, respectively. (B) Close-up of the interaction between the Fab and the virion proteins illustrates a complex discontinuous epitope. Such information can be highly valuable for patents and further vaccine development.*

At Biosynth, we provide a peptide-based epitope mapping service, which was invented by the founders of Pepscan, now part of Biosynth, more than 35 years ago. Our epitope mapping platform uses a solid support with a proprietary hydrogel matrix. Peptide sequences are directly synthesized on this matrix at a high density using robust Fmoc peptide synthesis. This results in highly sensitive arrays and reliable detection of even the weakest binding signals, making the platform suitable not only for epitope mapping but also for mapping other protein-protein interactions. The reusability of the arrays permits screening of a series of antibodies or sera on a single array, making peptide epitope mapping a cost-effective option for best candidate selection, antibody characterization, antibody profiling and further development.

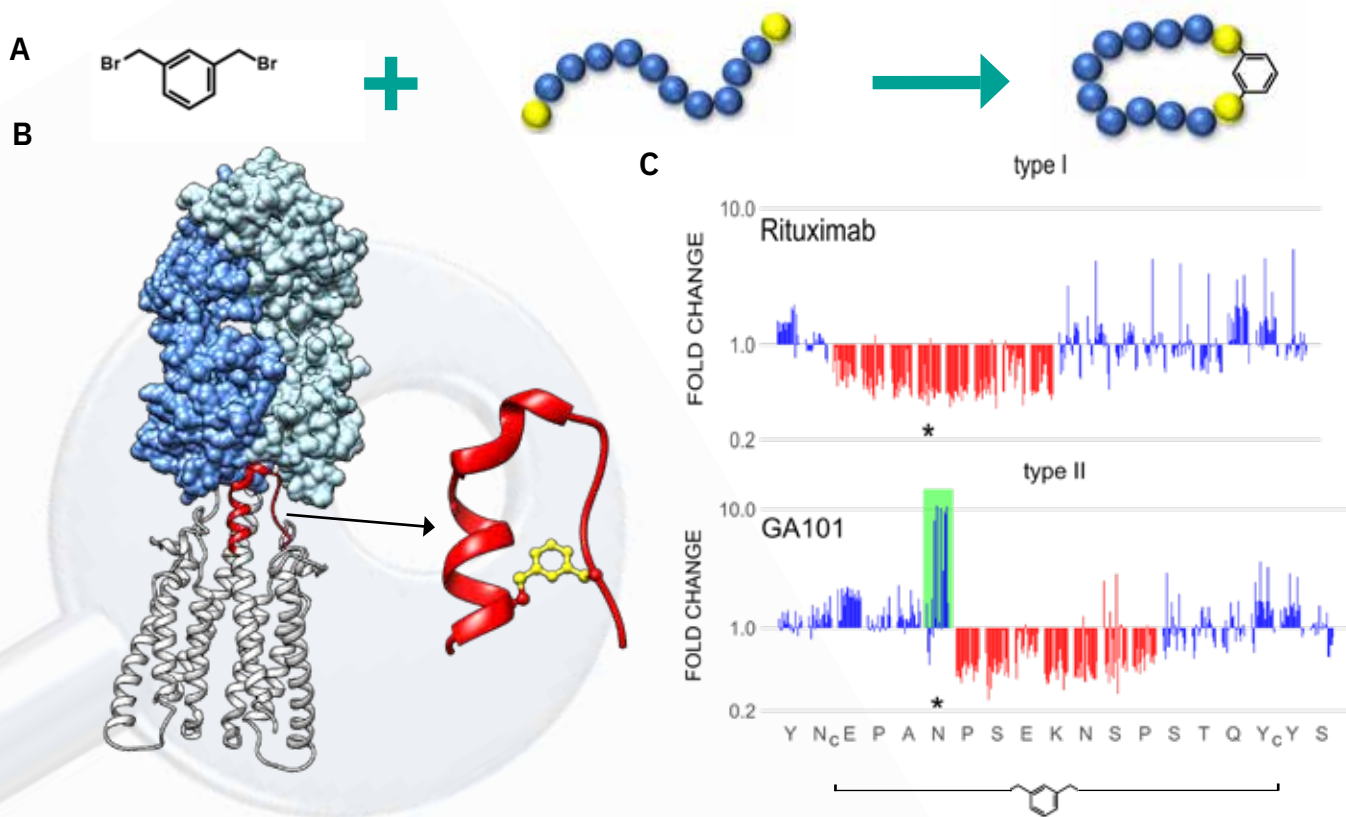
## Biosynth's Peptide Based Epitope Mapping Platform

- Specific binding site information for FDA/EMA approval of novel antibodies
- Protects intellectual property (IP) or creates freedom to operate (FTO)
- Supplies detailed information for selection of lead antibodies
- Identifies and optimizes peptide leads for protein-protein interactions

For more information visit our website at [www.biosynth.com/biologics/epitope-mapping](http://www.biosynth.com/biologics/epitope-mapping)

# CLIPS™ Epitope Mapping

The inclusion of conformational peptides broadens Biosynth's epitope mapping applications and delivers unparalleled sensitivity for all sample types, even tagged proteins. Our team generates microarrays with overlapping linear and structurally constrained CLIPS™ peptides which mimic the conformational elements of the target protein. An applied sample can then specifically bind either linear or conformational peptides, as they may be present in the epitope.



(A) The CLIPS™ scaffold can react with naturally present or introduced cysteines in a linear peptide to form a conformational peptide. (B) Structural information showing the conformational epitope of GA101 (Obinutuzumab) in complex with CD20 (Kumar, 2020). (C) Our CLIPS™ epitope mapping platform identified the key conformational epitopes for type I and type II anti-CD20 antibodies well before this structural evidence (Niederfellner, 2011). Residues in the epitope were individually replaced with other natural amino acids. Each bar represents the binding of a mutant peptide relative to the native. Key residues do not tolerate substitutions, e.g., N171(\*) for Rituximab. In contrast, many substitutions in N171 could even improve binding for GA101, illustrating the potential of the platform also in peptide lead optimization.

## Key Benefits

- Broad Applicability – linear, conformational, discontinuous, and complex multimeric protein epitopes
- Target Diversity – soluble targets, exodomains, membrane proteins, viruses
- Sample Diversity – antisera, polyclonal Abs, purified mAbs, nanobodies, tagged proteins or complexes
- Due to high sensitivity of our platform even the weakest interactions can be characterized
- Reusable Arrays – dozens of samples on a single array, cost-effective and direct comparison of Abs

Our scientists manage epitope mapping according to the below workflow



5-12 Weeks

# TB

## Global Reach



## Global locations

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# Glucoside Products and Services

**Glucosyltransferase Kit**

**Custom Glucoside Synthesis Services**

**Glucoside Products**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Glucosyltransferase Kit

Glucosyltransferase (GTases) can be utilized as enzymes to transfer glucose to another organic molecule (aglycon) establishing glycosidic linkages. UDP-glucose dependent GTases are part of the enzyme family of glucosyltransferase, they are versatile tools in glycosylation reactions. Our kit contains 8 lyophilized enzymes, which cover a wide range of different aglycons for the synthesis of glucosides: aliphatic, terpene, aromatic and heterocyclic glucosides can be synthesized using our glucosyltransferases.

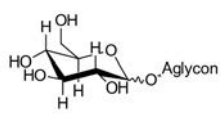
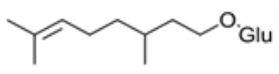
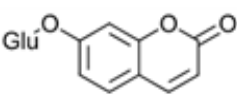
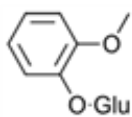
The Glucosyltransferase Kit contains 100 mg – 1 g of each of the following glucosyltransferases:

Glucosyltransferase Kit EGT_Kit01			
EGT201.6	EGT203.6	EGT004.6	EGT005.6
EGT006.6	EGT210.6	EGT211.6	EGT227.6

The activity towards selected substrates is presented in Table 1:

Table 1: Product conversion of selected substrates (++ = Substantial conversion of product, + = Low product formation detected, - = Low or no reaction product detected)

## Custom Glucoside Synthesis Services

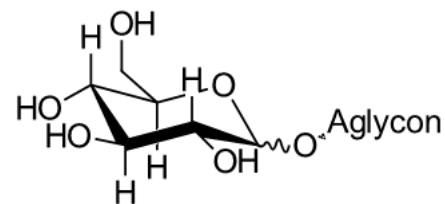
Aglycon	Citronellol	7-Hydroxy Coumarin	Guaiacol
Product 			
GT201	+	-	-
GT203	-	+	++
GT204	-	++	++
GT205	++	++	++
GT206	++	-	-
GT210	+	++	++
GT211	++	++	++
GT227	-	-	++

Furthermore, Biosynth offers customized glucoside synthesis for you. Our glucosyltransferase library contains over 70 different glucosyltransferases, which we offer to screen to identify suitable enzymes and optimum reactions conditions for your substrates of interest.

Once we have identified suitable enzyme candidates for your substrate, we offer process development to synthesize your target product and produce it for you at large scale, or supply you with the identified high-quality GTase enzymes in industrial quantities.

## Glucoside Products

Biosynth offers a variety of different O- and N-glucosides, such as aliphatic, aromatic, terpene and heterocyclic glucosides. Our O-glucosides (beta) have the following structure:



The glucoside portfolio is presented in Table 2.

Aliphatic			Terpenes (linear)			
1-Hexanol Glucoside	cis-3-Hexen-1-ol Glucoside	1-Octen-3-ol Glucoside	Citronellol Glucoside	Geraniol Glucoside	Nerol Glucoside	L-Linalool Glucoside
DH04978	MH145558	MO182722	XC182724	MG15594	XN182734	XL182730
59080-45-4	95632-87-4	74356-49-3	22850-15-3	22850-13-1	22850-14-2	104154-37-2
Terpenes (cyclic)						
(-)-Borneol Glucoside	L-Menthol Glucoside	S(-)-Perillyl Alcohol Glucoside	L-Carveol Glucoside	α-Terpineol Glucoside	Myrtenol Glucoside	
XB182721	MM76154	MP182736	XC182729	XT182739	XM182733	
88763-93-3	16203-27-3	141206-20-4	113349-30-7	39015-85-5	128385-61-5	
Terpenes (aromatic)		Aromatic/heterocyclic				
Thymol Glucoside	Carvacrol Glucoside	Paracetamol Glucoside	Methylanthranilate Glucoside	Vanillin alcohol Glucoside	Eugenol Glucoside	Raspberry Keton Glucoside
MT06890	XC182723	MP182735	MM182732	XV182738	XE182726	MR15464
20772-23-0	42035-60-9	75716-11-9	1875079-80-3	1383997-16-7	18604-50-7	38963-94-9
Benzyl alcohol Glucoside	2-Phenylethanol Glucoside	Cinnamyl alcohol Glucoside	Guaiacol Glucoside	Sesamol Glucoside	7-Hydroxycoumarin Glucoside	8-Hydroxyquinoline Glucoside
MB05178	MP15471	FP152931	XG182727	XS182737	FS66284	EH04988
4304-12-5	18997-54-1	69306-80-5	6092-24-6	199291-04-8	93-39-0	29266-96-4
Maltol Glucoside	Ethylmaltol Glucoside	Furaneol Glucoside	Homofuraneol Glucoside, Isomer Mixture			
MM182731	ME182725	MF30167	XH182728			
20847-13-6	1838567-35-3	121063-56-7	157309-55-2/157309-56-3			

Please visit our website for more information on the above products and many more different alpha and beta-glucosides.



## Global Reach



### Global locations

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Switzerland	India
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BIOSYNTH®

# Raw Materials for In-vitro Diagnostics

**Antigens and Antibodies**

**Veterinary Science**

**Sustainable Innovative Products**

**Essential *in-vitro* Diagnostic Tools**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Raw Materials for in-vitro Diagnostics



Best-in-class tools, research area-specific products and custom services to clinical and veterinary diagnostics. Our catalog features immunoglobulins, proteins and biospecimens. These come from humans and a variety of species to suit your clinical needs.

- Largest provider of bulk disease state plasma for controls in Europe
- Custom manufacture of new recombinant antigens under ISO 13485:2016 conditions
- Routine manufacture of bulk antigens and antibodies
- Full raw material menu for chemiluminescence platforms

## Antigens and Antibodies

With more than 45,000 antibodies and antigens, including bulk and custom supply, we are constantly adapting to meet the demands of emerging infectious diseases in humans and animals. We offer antibodies and antigens for globally relevant viruses and bacteria such as Monkeypox, Hepatitis, HIV, Yellow Fever, Zika, Chlamydia, Tetanus and many more.

See our new range of novel human hybrid IgM monoclonal antibodies as an alternative to hard-to-find human disease state IgM plasma.

For scientists researching cancer, neuroscience, endocrinology, cardiology, cell biology, apoptosis, immunology, and veterinary science we have a vast array of research area-specific products. A prime example is our brain lysate controls and key analytes like amyloid-beta, tau, alpha-synuclein, Huntingtin and Apolipoprotein E for neurodegenerative diseases.

## Veterinary Science

To ensure the health of domestic and farm animals for both endemic and emerging diseases we provide species specific raw materials for immunoassay development. Our offering includes a wide range of antibodies and antigens to detect infectious diseases e.g. Cache Valley and Kairi Virus and serum proteins such as CRP and SAA for detection of tissue injury and inflammation. See also Biosynth's range of enzyme substrates for pathogen detection.

## Sustainable Innovative Products

Biosynth has a strong commitment to sustainability without compromising on quality and performance. That is why we have available superior animal-friendly replacements for the commonly used products Bovine Serum Albumin and Fetal Bovine Serum.

- Two unique animal-free BSA products; Recombinant and synthetic alternatives.
- Bovine Platelet Lysate (bPL) – a cost-effective, consistent quality replacement for FBS in all cell culture applications. bPL uses plasma samples sourced using methods that prioritize the welfare of cows rescued from dairy farms and slaughterhouses.
- Animal-free FBS – Chemically defined media supplement with proven success in growing primary cell cultures.

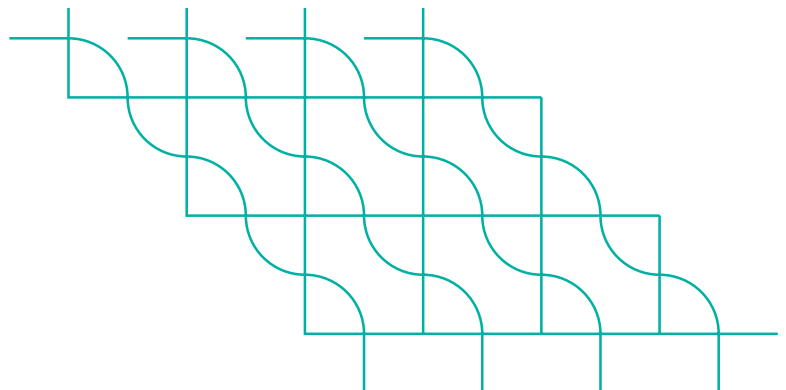
## Essential *in-vitro* Diagnostic Tools

We supply the vital building blocks to create reliable and high performing assays, customized to detect specific biomolecules. Our products are perfect for use in immunoassays including western blotting, immunohistochemistry, immunofluorescence, ELISA, and lateral flow.

- ✓ **Primary and Secondary Antibodies** – Antibodies from all commonly utilized host species, available in purified forms or conjugated to a range of tags and labels.
- ✓ **Proteins** – Native and recombinant proteins for use as experimental controls or to produce an immune response.
- ✓ **Biospecimens, Serum Plasma and Blood** – Suitable matrices to support immunoassay analytes of interest. Choice of disease state human serum and plasma, as well as animal serum products from rabbit, goat, horse, porcine, bovine and many more. Our serum products come in various quantities and a range of sources, purity, treatment and filtration levels.
- ✓ **Research Kits** – Ready-to-use, highly sensitive ELISA kits for the reliable detection and quantification of targets of interest, such as hormones, cytokines, peptides, toxins, infectious disease, drugs, antigens targeting a spectrum of species and sample types.
- ✓ **Biological Reagents to Enhance your Immunoassay** – Blocking peptides, Hapten conjugates, Enzymes, Poly-HRP Products, Colloidal Gold and Silver products, Chemical References, Diluents, Surfactants, Substrates, IHC reagents, Mounting media and preservatives, Controls and Calibrators, Isotype controls, Buffers.



Find our extensive IVD offering  
at [www.biosynth.com/biologics/  
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## Global Reach



### Global locations

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# GMP Peptide Manufacture

Combining smart peptide science and flexible GMP manufacturing capabilities.

GMP compliant synthesis services for peptide NCEs and commercial peptides.



Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# GMP Peptides from Biosynth

At Biosynth we combine smart peptide science and flexible GMP manufacturing capabilities. We offer GMP compliant synthesis for peptide NCEs and commercial peptides. From early R&D to GMP peptides supply, Biosynth's team of experts is passionate about devising a customized synthesis plan to meet your needs.

At our facility in the Netherlands, we provide synthesis of drug substances suitable for use in clinical trials (according to EudraLex). We also participate in the optimization and scale up of the synthetic protocol for the NCEs.



- Strong track-record and flexible GMP manufacturing capabilities.
- Short timelines for different phases of production.
- Best practice template for process, analytical methods and documentation.
- Synthesis protocols that are fully optimized by experts in peptide chemistry.
- Range of QC analyses under GMP as well as stability testing
- Upscaling service.

## Scientific and Operational Excellence

Our efficient set-up, combined with our flexible team and organization, enables us to reliably deliver GMP peptides on short timelines. Biosynth can support all phases of the product life cycle from discovery to commercialisation.

We have an additional service to deliver a CMC report to support IMPD/IND filing. We are experienced in stability testing according to the Q1A principles of the ICH guidelines.

## GMP Specialities:

- Diagnostic peptides.
- Antimicrobial peptides.
- Lipidated peptides.
- Peptide theranostics.
- Step-wise multiple disulfide bond formation.
- Peptide (fluorescent) labeling.
- Incorporation of non-natural building blocks.
- Radiopharmaceuticals & synthesized precursors for radiolabeled peptides.



## Therapeutics Areas

Oncology  
Neurology  
Dermatology  
Antimicrobials  
Virology

## Applications

Theranostics  
Immunotherapy  
Diagnostics  
Vaccines  
Therapeutic Peptides

## Modifications

CLIPS™ Technology  
(Multi) Cyclic Peptides  
Lipidated Peptides  
Post-Translational  
Modifications

## Partnership at Every Stage

With a diversified offer from peptide discovery and R&D up to GMP production, Biosynth's team is passionate about peptides and experts in developing custom synthesis plans that meet your needs.

## Key Benefits of Working with Biosynth

With our strong track-record and flexible GMP conforming manufacturing capabilities, we enable you to start your clinical trial with confidence.

- GMP manufacturing with ISO 9001:2015 certification to suit your regulatory requirements.
- Short timelines across GMP production phases due to flexible in-house peptide expertise.
- Expert-optimized synthetic protocols, focus on yield improvement and cost reduction.
- A range of different analyses under GMP (e.g. identity and purity, peptide content, residual solvents (e.g. ACN/TFA), H<sub>2</sub>O, bioburden), sequencing.



For more information about our GMP peptide production visit:

[www.biosynth.com/peptides/gmp-peptides](http://www.biosynth.com/peptides/gmp-peptides)

# B

## Global Reach



### Global locations

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BIOSYNTH®

# Custom Peptide Synthesis

High Throughput Peptide Synthesis

Complex, Long, Labeled and Bridged Peptides

Stable Isotope Labeled Peptides

Seamless Ordering and Tracking

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Custom Peptide Synthesis



We specialize in meeting our customer's needs and delivering the highest quality and service. Our experienced synthetic chemists are ready to meet your peptide needs from a single, simple peptide, a variety of complex labeled products, or an extensive library for screening.

Our state-of-the-art high-throughput production enables rapid turnaround times, high flexibility, and the efficient fulfillment of large peptide orders. High Throughput Synthesis is available for vaccine generation, neoantigen peptides, screening, epitope mapping, and more.

Our peptide production facilities are ISO 9001:2015 certified across the US and Europe. We also offer peptide synthesis with full GMP compliance, ensuring the highest quality standards in our peptide production.

For when speed is of the essence, try our new online ordering system with the Peptide Quotation Tool. By ordering online the process of getting your peptide couldn't be quicker.

Try out our Peptide Quotation Tool today and set up your free web account to access features such as order tracking and discounts.



## Synthesis Technologies

Biosynth has the capability and expertise to perform a wide variety of chemistries such as:

- Solid phase peptide synthesis
- Solution phase synthesis
- Native chemical ligation
- Glycochemistry
- Small molecule synthesis
- High throughput synthesis
- PEGylations, and more

## Multi-Disulfide Peptides and Cyclic Peptides

Obtaining biologically active, fully folded peptides can be key. We have extensive experience folding highly complicated molecules to their biologically active forms, whether folding naturally or by using an orthogonal protection strategy. Additional types of cyclizations and peptide macrocycles are available such as Head to Tail, Internal Lactam, and stapled peptides. We are an industry leader for RGD-related cyclic and multimeric peptides, conjugates.

As part of our commitment to customer service, we ensure you have a personalized Ph.D. level consultation with experienced peptide chemistry experts to determine the best approach for your project.



## Complex and Labeled Peptides

**Labels:** We can incorporate labels such as TAMRA, FITC or Biotin using a mini-PEG™ spacer. We can also incorporate Rhodamine, special or d-amino acids, stable isotopes, EDANS, Dabsyl, Dansyl, Abz, thiolactic acids, and more.

**Peptide-Protein Conjugates:** The conjugates can be customized as needed. Selective heterobifunctional crosslinkers allow for selective attachment of a Cys-containing peptide to the protein of your choice.

### Peptide Modifications:

- Acylation
- Amidation
- Biotinylation
- Cyclizations
- Alkylation
- Lipidation
- Pegylation
- Phosphorylation
- Coupling for imaging agents
- Click chemistry
- Linkers
- Spacers

### Peptidomimetics:

- Hydroxyethylene Isostere Reduced Peptide Bonds
- Aldehydes
- Chloromethylketones
- Depsipeptides
- Phosphonates



## Proteomics Tools

As part of our range of products and services to support proteomics, we are excited to be able to offer NEptune™, the industry's first complete suite of peptide and antibody SIS products and services.

- **TrypRaws™:** SIL amino acids and resins Arg (+10) and Lys (+8) loaded for peptide synthesis. SIS CAPA Assay Technologies tryptic Stable Isotope Standards for SISCAPA workflows.
- **TrypTides™:** custom heavy SIL peptides optimized for MS with >99% Isotopic Purity. Individual peptides with purities from crude to >98% are available in 1nmol to gram quantities, with customisable aliquoting. In-house Amino Acid Analysis for accurate quantitation.
- **TrypKits™:** MS-MRM kit manufacturing with peptide synthesis and anti-peptide antibody production. With analyte pooling, peptide pooling and mixtures available. Peptide quantification, aliquoting and labelling as part of the process.
- **TrypBodies™:** custom poly and monoclonal antibodies for Immuno-MRM (iMRM) with specialized protocols to maximize MS performance.

For further information on our custom peptide synthesis services visit us at [ww.biosynth.com/peptides/custom-peptides](http://ww.biosynth.com/peptides/custom-peptides)



## Global Locations

Discover all our locations at [www.biosynth.com/worldwide-locations](http://www.biosynth.com/worldwide-locations)

Switzerland

United Kingdom

Ireland

Slovakia

United States

China

India

South Korea

Japan

Austria

Netherlands

Germany

## About Biosynth

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals - where Chemistry meets Biology, Products meet Services and Innovation meets Quality, Biosynth is at the Edge of Innovation. With an unrivaled research product portfolio of over a million products and end to end manufacturing services, we are science led and customer focused to solve problems, taking pride in delivering products and projects that others cannot. Our expertise and capability runs across Complex Chemicals, Peptides and Key Biologics all from one trusted partner.

## Contact us

[sales@biosynth.com](mailto:sales@biosynth.com)

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The background of the entire page is a microscopic image of cells, likely cancer cells, showing their internal structure and nuclei. The cells are rendered in warm tones of orange, red, and yellow. A solid blue vertical bar covers the left side of the page, serving as a background for the text.

BIOSYNTH®

# Neoantigen Peptides

**Spearheading Neoantigen Peptides  
for Personalized Immunotherapy**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Neoantigen Peptides from Biosynth

Planning a clinical trial using peptide neoantigen APIs? Looking to stimulate T-cells for personalized T-cell therapy? Or do you need to validate the immune cell activation against your neoantigen targets?

Preparing neoantigen peptides demands the highest levels of care and reliability. Peptides must be tailored to each patient and delivered in time for patient treatment. We work side by side with you to make your clinical trial a success. Today, we are manufacturing peptides for phases I and II for clients in Europe, North America and Asia Pacific.

A typical personalized neoantigen vaccine value chain starts with a biopsy and ends with patient treatment. We are the key link of supplying the neoantigen peptides in this chain.



## Peptide Pools (Injectables)

- APIs for Use in Clinical Trials (phases I and II)
- Individual or Pooled Peptides
- Quality Management System (QMS)
- Regulatory Compliance

- Guaranteed high quality customized neoantigen peptides
- Manufactured according to GMP standards
- Advice on and execution of peptide pooling based on solubility testing of individual peptides
- Redundant, reliable setup of our all-in-one facility
- Fast turnaround times

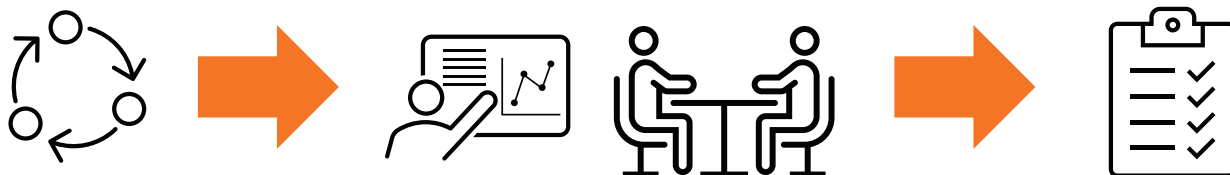


# How We Work

At the start, every project undergoes a feasibility and optimization process.

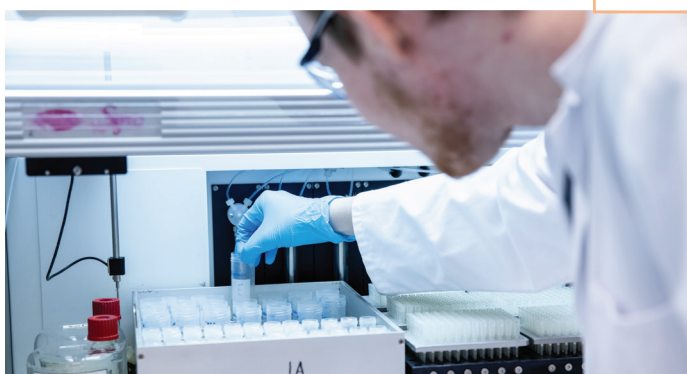
Then, a detailed plan is created and reviewed in consultation with your team.

As an additional service, we deliver a CMC report to support regulatory filing (IMPD/IND/HREC).



## T-cell Stimulating Libraries (*in vitro* Application)

- Peptide Libraries for R&D
- Short Lead Time
- 25K Peptides/Month Capacity



**For more information on our peptide services, including custom synthesis and library production, lead discovery and neoantigen peptides, visit [www.biosynth.com/peptides](http://www.biosynth.com/peptides)**

# TB

## Global Reach



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BIOSYNTH<sup>®</sup>

# Peptide Discovery and Optimization

**CLIPS™ Technology**

**Phage Display**

**Lead Identification and Optimization**

Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Discovery and Optimization with CLIPS™

Our group of experts have developed a uniquely versatile and broadly applicable technology for constraining the 3D conformation of peptides, called CLIPS™ (Chemical Linkage of Peptides onto Scaffolds). Unlike other constraining methods, CLIPS™ chemistry can create redox-stable mono-, bi- or tri-cyclic formats\* and is compatible with the presence of side-chain-unprotected amino acids. CLIPS™ peptides have shown their benefits in many areas.



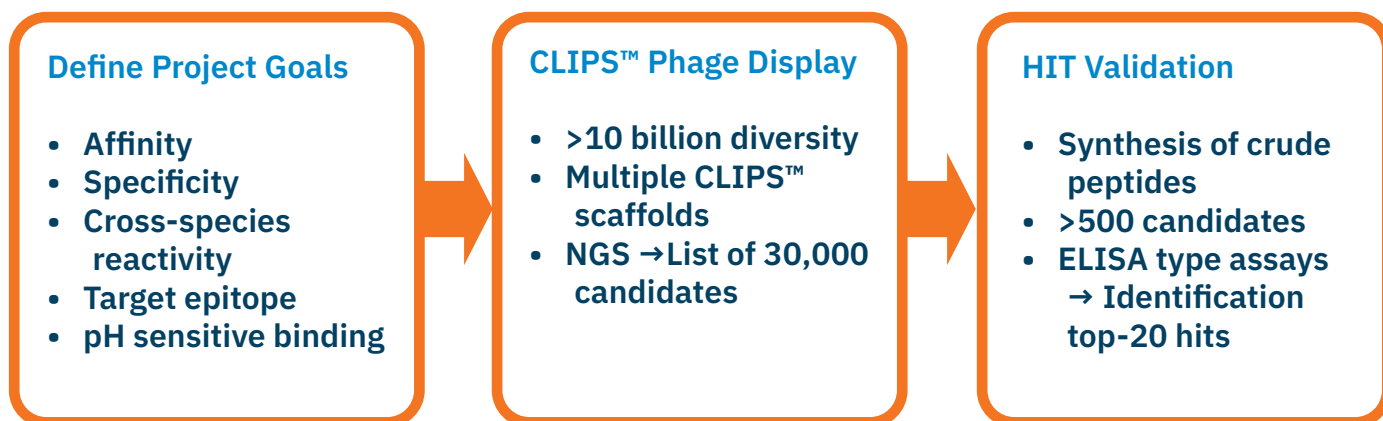
For our peptide discovery service, we can combine CLIPS™ peptides with phage libraries expressing millions to billions of different peptide sequences of different length to screen as monocycles or bibriges for binding against your target of interest. High-throughput hit validation is performed using chemically synthesized peptides with ELISA-type assays followed by lead identification using the best hits to measure binding affinities to your target of interest and stability in complex media. Finally, your top leads can be improved by different strategies during lead optimization, providing you with a high potential CLIPS™ lead peptide.

## Steps in Lead Optimization



- Changes to peptide length (shorten or extend)
- Alanine scanning → identify critical sites
- Amino acid replacement analysis → identify sites and motifs for optimization
- Replacements with non-natural amino acids → enhance potency and stability

## Partnership at Every Stage



\* The bicyclic peptide domain is further developed by Bicycle Therapeutics since a technological cooperation started in 2009. For this reason we have no freedom to use bicyclic peptides in Phage Display.

## Multiple Formats for Peptide Optimizations

	Arrays	Unpurified	Purified 70-90%
Form	Surface-Immobilized	Solution/Powder	Solution/Powder
# of Peptides/ Optimization Run	1,500	300	100
Lead Times	8 weeks	6 weeks	6-8 weeks
Scale	< 1 µg	2 µmol, 1-4 mg	20 µmol, 1-10 mg
Length	Up to 20 AA	Up to 30 AA	Up to 40AA
Compatible Assay <small>*Assay not offered by Biosynth</small>	ELISA-style assay	ELISA-style assay GCI (SPR-type) assay Cells assays*	ELISA-style assay GCI (SPR-type) assay Cells and animal assays*
CLIPS™ Compatible	Yes	Yes	Yes

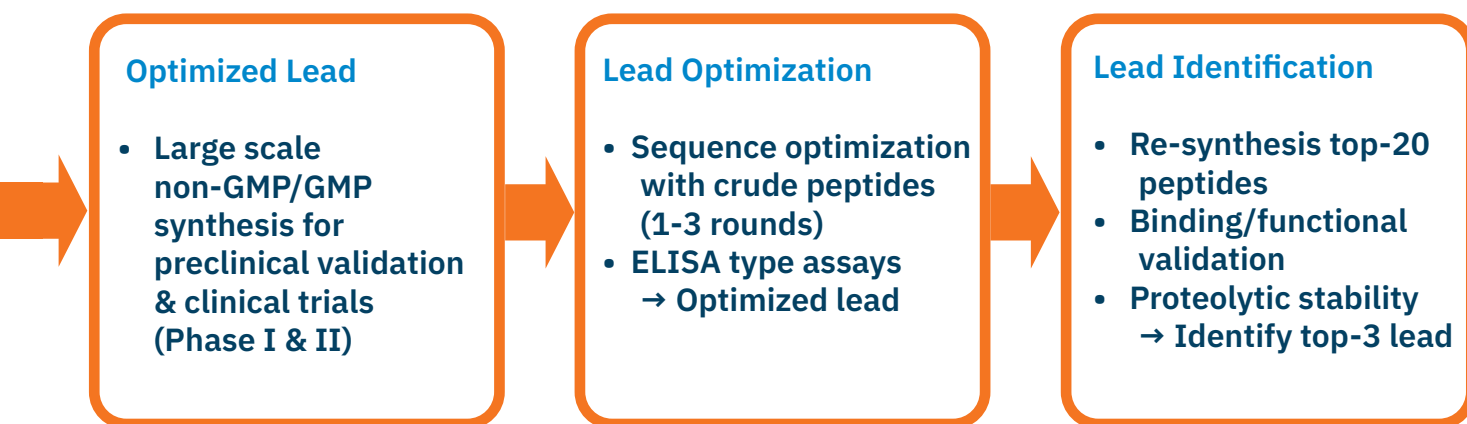
## Key Benefits of Working with Biosynth

### Close Collaboration

- Evaluation of target difficulty, detailed project set-up, regular update meetings

### Business Model: Fee for Service + Milestones

- Target exclusivity while project is running, with the Milestone Payments, IP of compound class belongs to client, no royalties



For more information on our peptide services, including custom synthesis, visit [www.biosynth.com/peptides](http://www.biosynth.com/peptides)

# TB

## Global Reach



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BIOSYNTH®

# Theranostic Services

**Radiopharmaceuticals**

**Smart Peptide Technologies**

**Flexible GMP Manufacturing Capabilities**

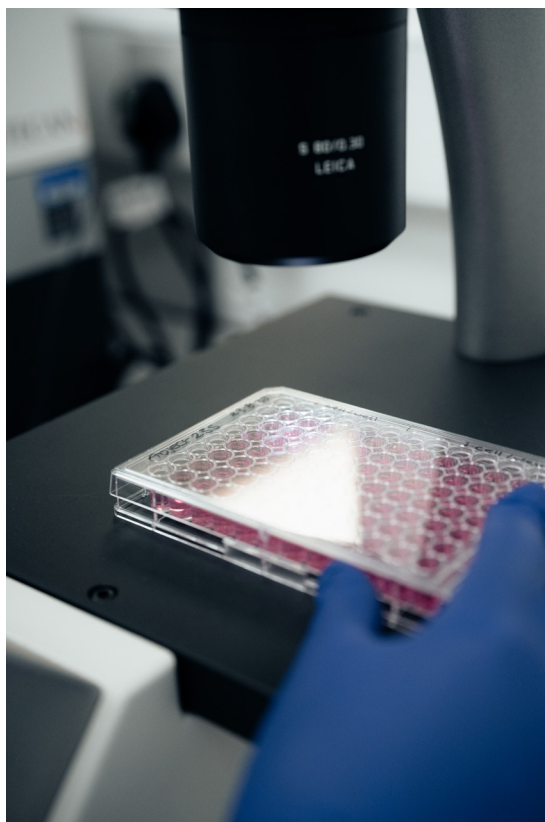
Critical Raw Materials and Services for Diagnostics, Vaccines and Pharmaceuticals

# Theranostics

Theranostics are a rapidly growing field. The idea behind this includes a combination of therapeutics and diagnostics in one molecule. Peptides are an ideal support for delivery of both, radioactive markers and therapies to a tumor tissue. Biosynth has a proven track record in the field of radiopharmaceuticals and synthesis of radiolabeled precursors suitable for a wide range of applications. Next to custom synthesis, Biosynth also has a platform of Peptide discovery which allows the development of *de novo* peptides. These services utilize our unique CLIPS™ phage display platform to discover highly constrained *de novo* peptides with enhanced affinities, selectivities and proteolytic stabilities.

## Turning Your Project into a Success Story

We assist you in progressing your peptide project through the various stages of clinical development, application and commercialization. Our lean processes and organization meet the pharmaceutical industry's standards and support us in making your clinical trial a success story. From feasibility to GMP synthesis, every project is carefully planned and discussed. We work together with you to reduce the effort, timelines and overall costs. The optimized process is used for synthesis and compiled in a CMC report which can be used for regulatory filings (IMPD/IND/HREC). Our downstream process is performed in our Class D cleanroom. As part of our flexible approach, APIs are prepared from milligram scale up to several grams.

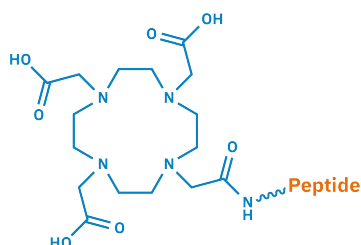


- End-to-end peptide service, from peptide discovery and lead optimization to R&D production.
- Strong track record and flexible GMP manufacturing capabilities.
- Best-practice templates for processes analytical methods and documentation.
- Expert-optimized synthetic protocols focus on yield improvement and cost reduction.

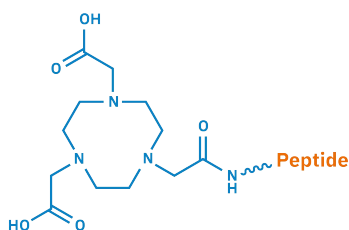
# Metal Chelators for One-Step Labeling of Peptides

Versatile introduction of metal chelators at either the N-terminus or in the backbone of the peptide via orthogonal chemistry. Currently there is already a wide range of available chelators, and we are always looking to introduce new types:

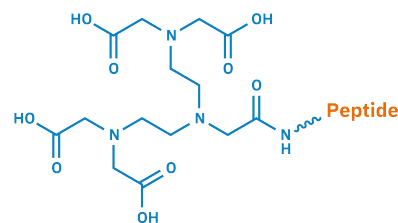
- DTPA, DOTA, NOTA, DOTA-GA and others. These chelators display a high affinity to commonly used multivalent radioactive metals, like Lu-177 ( $^{177}\text{Lu}$ ), Ga-67 ( $^{67}\text{Ga}$ ):



**DOTA-peptide conjugate**



**NOTA-peptide conjugate**



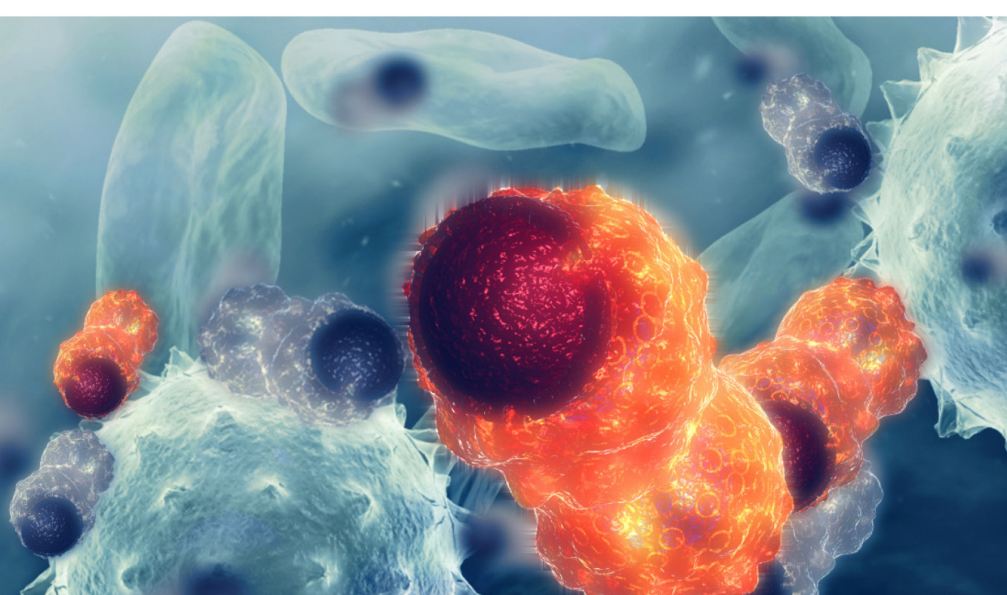
**DTPA-peptide conjugate**

- In-111 ( $^{111}\text{In}$ ) or Y-90 ( $^{90}\text{Y}$ ), or the cold metals Gd(III), or Y(III) used as MRI contrast agents or in PET or CT imaging.
- Desferrioxamine B (DFO, for  $\text{Zr}^{4+}$  or  $\text{Fe}^{3+}$  complexation).
- Technetium (Tc) chelators, e.g. mercaptoacetyltriglycine (MAG3) or water-soluble derivatives thereof. These are readily incorporated into site-specific labeled peptides with Tc-99m (of  $^{99\text{m}}\text{Tc}$ ).
- Precursors that can be labeled with radioactive metals.
- Biosynth provides disulfide-rich (DSR) peptides for tumor-targeting applications, in combination with almost every commercially available fluorescent dye (e.g. AlexaFluor™ 488, 594, 647, Fluorescein and Rhodamine/TAMRA).
- Possible incorporation of non-natural amino acids.



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