GenScript
Make Research Easy

Peptide Synthesis Services

Quality Solution for Therapeutic Development

[2023-2024 Edition]

www.genscript.com

Make People and Nature Healthier Through Biotechnology

ABOUT US

GenScript Biotech Corporation (stock code: HK.1548) is a leading global provider of life science research, development and manufacturing services. Rooted in solid gene synthesis technology, GenScript has established four major platforms: life science service and product platform, biomedical contract development manufacture organization (CDMO) platform, cell therapy platform and industrial synthetic biological products platform.

Founded in 2002, GenScript established its R&D and manufacturing headquarters in Nanjing, China in 2004. In 2015, GenScript was listed on the Main Board of the Stock Exchange of Hong Kong, with legal entities in the United States, China, Hong Kong, Japan, Singapore, the Netherlands and Ireland. It operated business in over 100 countries and regions worldwide, providing quality, convenient and reliable services and products for more than 100,000 customers.

As of Jun 30th 2022, GenScript owned more than 5,500 employees worldwide, with over 38% of them holding a Ph.D. or master's degree. GenScript has a number of intellectual property rights, including more than 190 granted patents and more than 820 patent applications, as well as a high dense technical secrets. With its mission of “making people and nature healthier with biotechnology” , GenScript is committed to be one of the most trusted biotechnology companies in the world. As of Jun 30th 2022, GenScript’ s services and products have been cited in over 74,700 peer-reviewed international academic periodical articles.

HISTORY & MILESTONES OF GENSCRIPT GROUP

2002

Founded in
New Jersey, US

GenScript
Make Research Easy

2014

Founded Legend Biotech
(Cell Therapy Segment)

LEGEND BIOTECH

2017

Legend Biotech and Janssen entered into global strategic collaboration on cilta-cel

LEGEND BIOTECH janssen

2013

Established Bestzyme
(Industrial Synthetic Biology
Product Segment)

Bestzyme

2015

GenScript was listed on HKEX
(stock code: HK.1548)

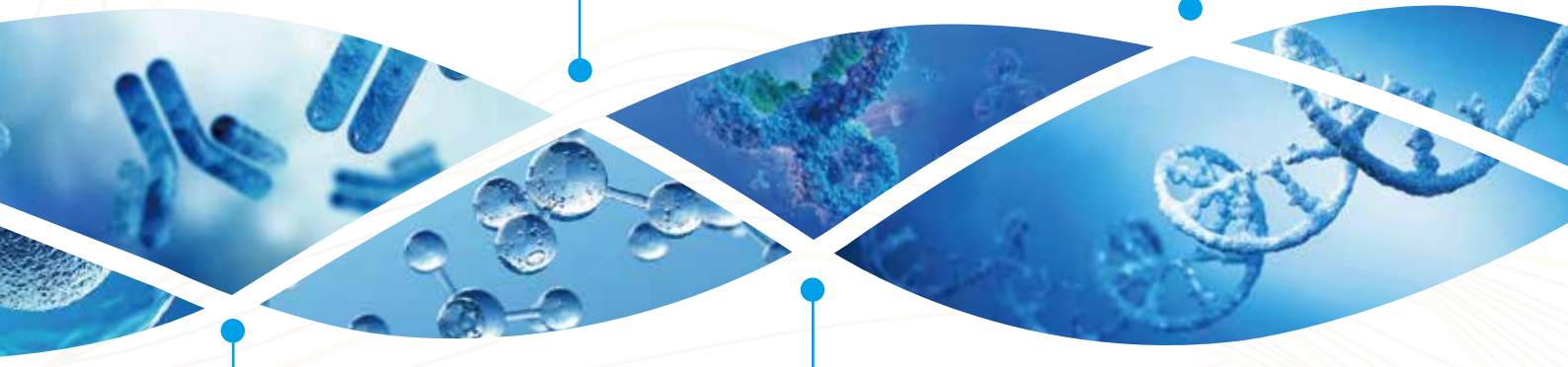
HKEX
香港交易所

2020

Legend Biotech was listed on Nasdaq
(NASDAQ: LEGN)
Launched GenScript ProBio

2022

CARVYKTI® granted approval by
US FDA, EC and Japan MHLW



2018

Established Biologics
CDMO Segment
(GenScript ProBio)

2021

Group, ProBio and Legend
Biotech received funding of
$1 billion from Hillhouse Capital

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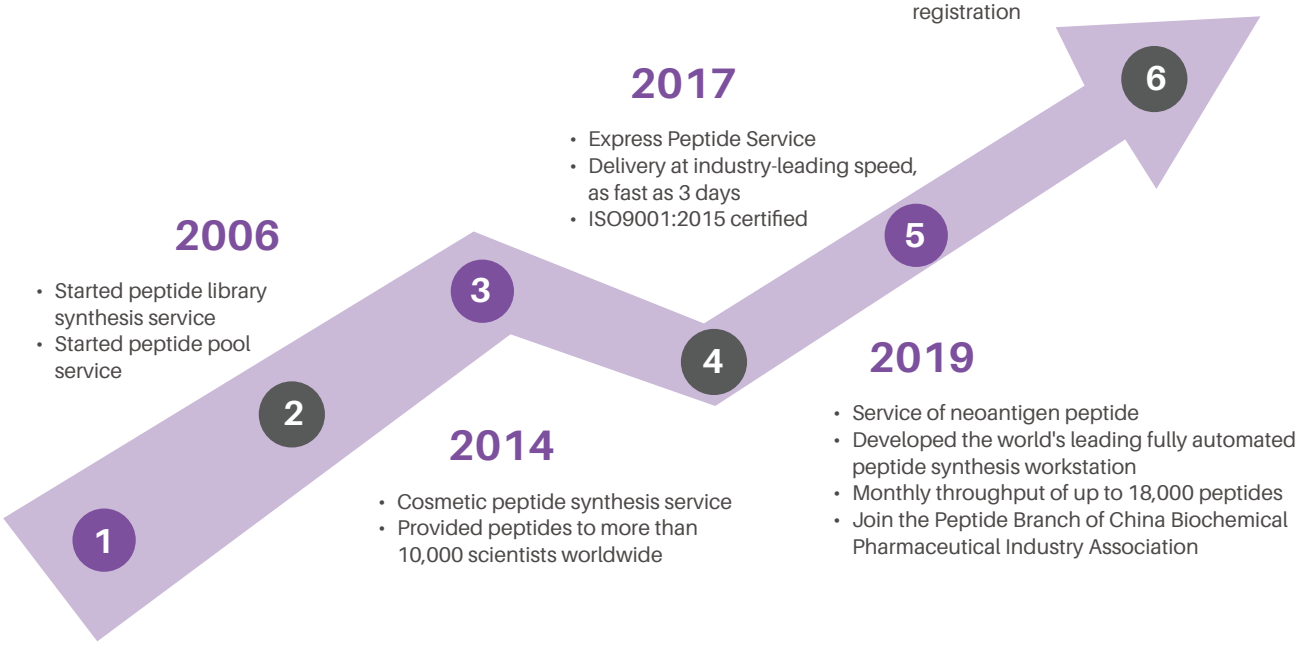
About GenScript Peptide Synthesis

History of GenScript Peptide Synthesis

- With more than 19 years of experience in peptide synthesis, GenScript is equipped with international leading peptide synthesizers, professional technicians and peptide synthesis and purification processes, and has provided peptide synthesis services and catalog products to more than 10,000 customers worldwide.
- GenScript peptide synthesis services include custom peptide synthesis, peptide libraries, large-scale peptide synthesis and industrial solutions such as neoantigen peptide services, cosmetic peptides and peptide drugs for R&D purposes.
- GenScript offers a wide range of catalog peptide products in stock, with one click order on the official website to meet different applications and R&D needs.
- Our proprietary PepPower™ platform is built based on our state-of-the-art facility that is equipped with fully automated synthesizers for liquid and solid phase peptide synthesis (LPPS and SPPS), microwave technologies, and proprietary ligation technologies. This greatly improves synthesis efficiency.



2004

- Established the Peptide Division
- Launched peptide synthesis services

2006

- Started peptide library synthesis service
- Started peptide pool service

2014

- Cosmetic peptide synthesis service
- Provided peptides to more than 10,000 scientists worldwide

2017

- Express Peptide Service
- Delivery at industry-leading speed, as fast as 3 days
- ISO9001:2015 certified

2019

- Service of neoantigen peptide
- Developed the world's leading fully automated peptide synthesis workstation
- Monthly throughput of up to 18,000 peptides
- Join the Peptide Branch of China Biochemical Pharmaceutical Industry Association

2020

- SARS-CoV-2 peptide service
- Cosmetic peptide stock solution service
- Helping the first domestic neoantigen company to be approved for clinical registration

Production Environment and Technology Platform

Each peptide synthesis in GenScript is subjected to strict QC processes, and the production environment and equipment are specially maintained and kept by dedicated personnel. Strict operation processes and management system ensure high quality and efficiency of peptide production.

With more than 19 years of experience in peptide synthesis, GenScript is equipped with international leading peptide synthesizers, professional technicians and peptide synthesis and purification processes. Our proprietary advanced synthesis platform and quality inspection system work in concert to provide customers with satisfactory products.

PepPower™ Peptide Synthesis Platform

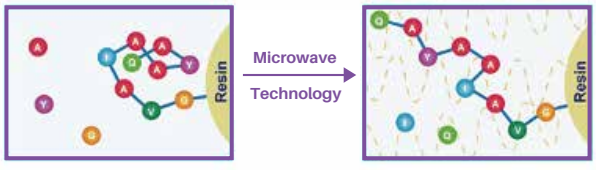
PepPower™ platform: based on GenScript's advanced automatic synthesis instrument, it integrates solid phase peptide synthesis (SPPS) technology, liquid phase polypeptide synthesis (LPPS) technology, microwave synthesis technology and proprietary ligation technology.

SPPS+LPPS

Liquid Phase Peptide Synthesis (LPPS) and Solid Phase Peptide Synthesis (SPPS) are the two main synthetic methods in peptide synthesis. With the combination of SPPS and LPPS, PepPower™ can take full advantages of both technologies to flexibly choose LPPS or SPPS that best suits peptide.

Microwave Synthesis Technology

GenScript PepPower™ platform, based on microwave synthesis technology, is a revolutionary technology. The microwave energy delivered prevents the growing peptide chain from folding or forming aggregates, and facilitates chemical bonding. Through microwave, peptides can be easily and efficiently stitched together, allowing the synthesis of longer peptides and the introduction of various modifications to the peptide chains, including the addition of sugars and other groups. With microwave technology, we can synthesize phosphor peptides with relative ease. Most importantly, microwave technology helps shorten peptide synthesis turnaround time, which allows us to launch Express Peptide Service that can deliver peptides in as fast as 5 days.



PepPower™ Platform Benefits

By combining SPPS, LPPS, microwave technology and our proprietary ligation technology for fragment condensation, GenScript PepPower™ synthesis platform takes advantage of several technologies to ensure high quality and rapid delivery of peptides.

	GenScript PepPower™ Capabilities	Market Average Level
Peptide length	<200 AA	4-50AA
Synthesis success rate	> 95%	75%
Peptide Delivery	From 5 days	2-3 weeks
Quantity range	mg - kg	mg, difficult in kg
Peptide cost	Low, flexible choice of several technologies, reduced costs	High
Modification	Easier modifications through our Microwave technology with higher efficiency	Modifications may be accompanied with side reactions

PepHTS™ Peptide Library Synthesis Platform

GenScript introduces the high-throughput PepHTS™ peptide library synthesis platform, incorporating an advanced, fully automated synthesis workstation to enable high-throughput peptide library synthesis with industry-leading speed and flexibility. With the PepHTS™ library synthesis platform, GenScript achieves fully automated and precise control of peptide library synthesis, significantly improving throughput and accuracy.

High throughput
18,000 peptides/month

Fast synthesis cycle
24-hour operation

Reliable quality
Fully automated synthesis

Flexible services
Two different types of services

PepHTS™ Platform Benefits

High Throughput	Reliable Quality	Fast Turnaround Time	Flexible Services
PepHTS™ library synthesis platform has a production throughput of 18,000 peptides per month	The platform can be fully automated, with precise control of production conditions and material addition, reducing quality instability and human error caused by manual operation	PepHTS™ platform can automatically carry out sequence analysis, determine efficient production methods, improve production efficiency, and operate 24 hours a day	There are regular Peptide Library services and Micro-peptide Library services available, as well as additional QC testing services according to different needs of customers.

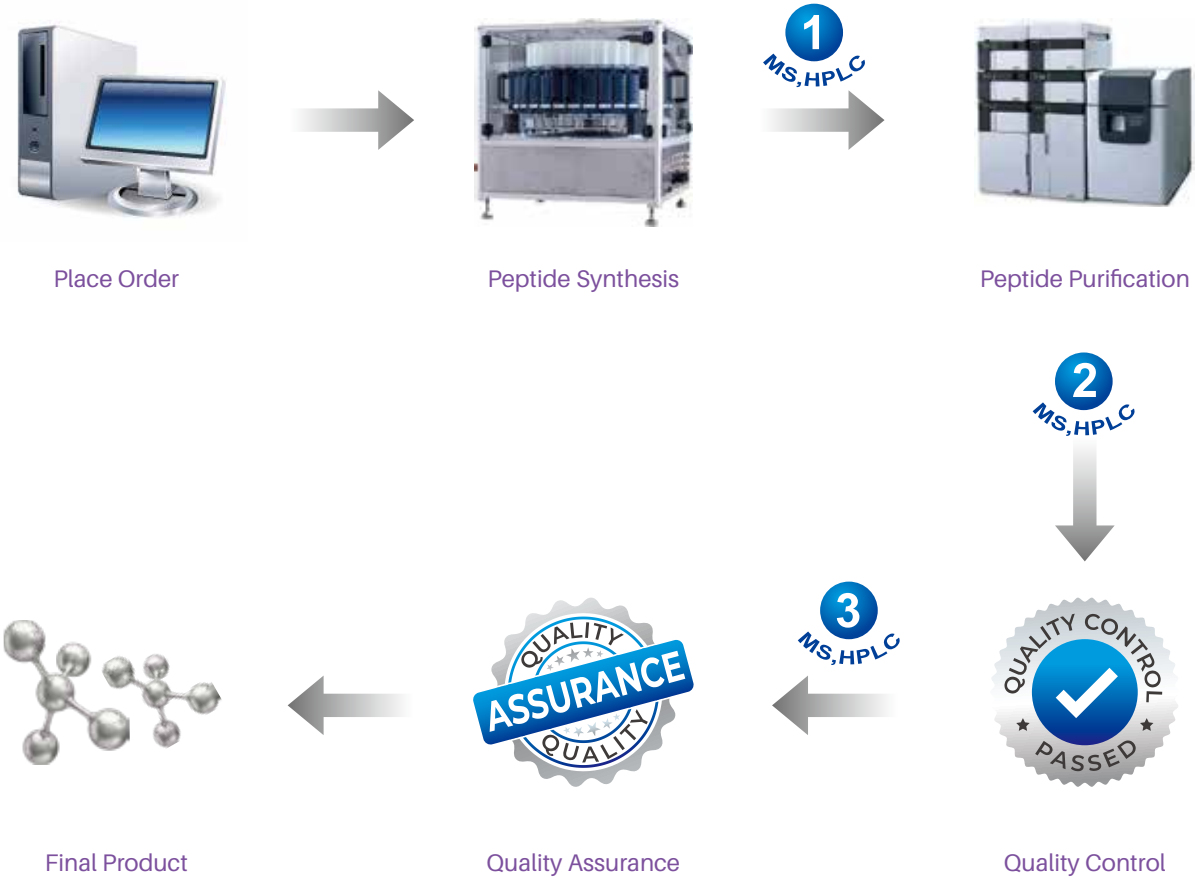
ArgonShield™ Packaging Technology

ArgonShield™ was designed by the skilled scientists at GenScript as an innovative packing and delivery technology, to eliminate the experimental variations caused by peptide oxidization and deliquescence of your custom peptides. For your convenience, ArgonShield™ technology is applied as a headspace of argon gas to all of GenScript's custom peptides.

More Precision	Extended Storage Time	Time and Budget Savings	Free Offer
It avoids unexpected errors due to oxidation and deliquescence during your peptide experiments	It enhances the long-term preservation of peptides by improving peptide stability	Longer shelf life allows you to order larger quantities of peptides at a time, shortening delivery cycle and saving additional shipping costs	The service is currently free of charge and is available for all GenScript synthetic peptides

Quality Assurance System

Custom synthesized peptides from GenScript are manufactured under strict high-level quality control processes. Our ISO 9001 certified, Total Quality Management (TQM) platform ensures that each custom peptide is triple checked for quality via both mass spectrometry (MS) and high performance liquid chromatography (HPLC) analyses after each step during peptide purification and quality control (QC) procedures. As the final step in our TQM platform, we perform additional quality assurance (QA) procedures for every custom peptide to further guarantee the delivery of high-quality peptides.



GenScript Peptide Synthesis Service TQM Platform

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Custom Peptide Synthesis Services

Regular and Express Peptide Synthesis

GenScript has been providing reliable custom peptides synthesis services for 10,000+ scientists worldwide for 16 years. With our proprietary microwave-assisted PepPower™ peptide synthesis platform, GenScript is now able to offer high-quality peptides with 100% guaranteed quantity at industry-leading speed, as fast as 5 days, to help expedite your research. Strict QC testing service ensures high quality delivery of each peptide.

Service Features

100% guaranteed maximum volume delivery
Avoiding the risk of insufficient volume

As fast as 5-day delivery
Facilitating rapid progress in research

Complete QC/QA system
Triple MS/HPLC detection
Comprehensive QC management

Inter-batch stability
Unique ArgonShield™ technology to protect peptide samples

Service Details

	Fast Peptide Synthesis [3]	Rush Peptide Synthesis [3]	Regular Peptide Synthesis [3]
Starting turnaround time [1] (Business Days)	6	5	10
Sequence length	Up to 25 AA		<200 AA
Purity Free Upgrade!	≥70% to ≥98%	Crude	Crude to ≥98%
Guaranteed Quantity [2]	Up to 100 mg		mg to kg
Solubility Test Service	Free		
TFA Removal Service	Standard Service		Standard & Guaranteed Service
Modifications	30+		300+

1. Turnaround time includes all business days from order confirmation to completion, not including shipping time.
2. Guaranteed quantity is valid for Regular and Express Peptide Synthesis Services on orders with less than 20 mg in quantity.
3. Custom Peptide service includes Regular and Express Peptide services. Express Peptide Synthesis Services includes Fast and Rush Peptide Synthesis Services. Express peptide synthesis service is limited for non-complex sequences and modifications, please contact us or request a quote.

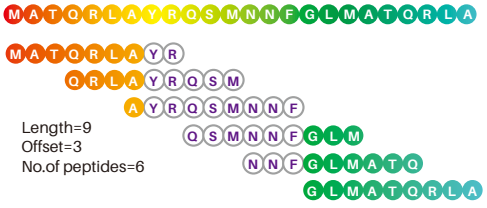
Delivery Standard

GenScript peptides are delivered in lyophilized powder form, dispensed in individual sample tubes according to customer requirements. To ensure peptide quality, GenScript also provides the following documentation and services.

HPLC/MS Test Report | **COA Document** | **ArgonShield™ Packaging Technology** | **Flexible Packing Options**

Peptide Library Synthesis

GenScript offers a wide range of peptide library synthesis services for applications in structural biology, peptide drug discovery and vaccine development. Based on the advanced PepHTS™ library synthesis platform, GenScript's peptide synthesis throughput can reach 18,000 peptides/month to meet the growing demand for peptides. Our peptide library design tools are available to assist in designing 7 types of peptide libraries such as overlapping peptide libraries.



Service Features

High Throughput
PepHTS™ library synthesis platform has a production throughput of 18,000 peptides per month.

Reliable Quality
Fully automated platform with precise control in production conditions and chemicals addition reduces human errors from manual operation.

Fast Turnaround Time
PepHTS™ platform can automatically carry out sequence analysis, determine efficient production methods, improve production efficiency, and operate 24 hours a day.

Flexible Services
There are regular peptide library and micro-peptide library services available, as well as additional QC testing services that caters to different needs of customers.

Service Details

	Crude Peptide Library Upgraded!		Purified Peptide Library	Crude Micro-scale Peptide Library	Purified Micro-scale Peptide Library
Turnaround time [1] (Business days)	9 - 17	15 - 20	15 - 20	15 - 20	
Sequence Length	5 - 15AA	16 - 25AA	5 - 25AA	5 - 20AA	
Purity	Crude		≥70% to ≥98%	Crude	>70%
Quantity	1 - 20 mg		1 - 9 mg	0.2 - 0.5 mg	
Minimum order size	24 peptides				
Deliverable format [2]	Lyophilized peptides in individual vials *Free* or 96-well plate *Charged*			Lyophilized peptides in 96-well plate *Free*	
Quality documents [4]	COA & MS only or COA, HPLC & MS for each peptide		COA, HPLC & MS for each peptide	COA, HPLC & MS for each peptide	
Modifications	Comprehensive: Biotin, Fluorescent Dyes, Phosphorylation, Methylation, Acetylation, Amidation, Head to tail cyclic, Disulfide bridge, Stable isotope labeled amino acids, Unnatural Amino Acids, and many more			Amidation, Acetylation, Biotin, FITC-Ahx, Isotope Labeling on K/R, Arg (13C6, 15N4), Lys (13C6, 15N2) and many more	

Cyclic libraries service consists of head-to-tail cyclic peptides or cyclic peptides with one disulfide bond are **coming soon.**

Peptide Library Design

GenScript offers free peptide library design tools, and a team of Ph.D. level experts in GenScript provide you with design guidelines for different downstream applications. For more information on peptide library design tools and guidelines, please refer to the resource center of this manual.

Large-scale Peptide Synthesis

Large-scale peptides (100 mg and above) are widely used in peptide drug development, food research and cosmetics field. The large-scale peptide synthesis not simply involves adding more raw materials, but involves a series of improvements such as process optimization and parameter adjustment to ensure economical and rapid delivery of the final product.

With more than 17 years of experience in peptide synthesis, GenScript can efficiently synthesize peptides at the kilogram level or above through its self-developed multi-channel large-scale peptide synthesis platform, and ensures the delivery quality of peptides by multiple QC detection.

Service Features

Throughput up to 2 kg

Success rate above 98%

Expert team
One-on-one project follow-up

Multi-synthesis platform
Economic and fast

Service Details

Default Service Items		Customization Options (Optional)
Purity	≥98%	• Process optimization • Sample trial • Customized analytical testing • Analytical method development • Parameter identification report • R&D report • Product report • Custom packaging or delivery
Quantity	Up to 2 kg	
Length	<200 AA	
Shipping method	Peptide lyophilized powder	
Quality certification	COA, HPLC and MS	
Project communication	Regular teleconference	

Related Applications

Peptide drug development

Cosmetic peptides

Antibacterial peptides

Industrial Grade Peptide Solutions

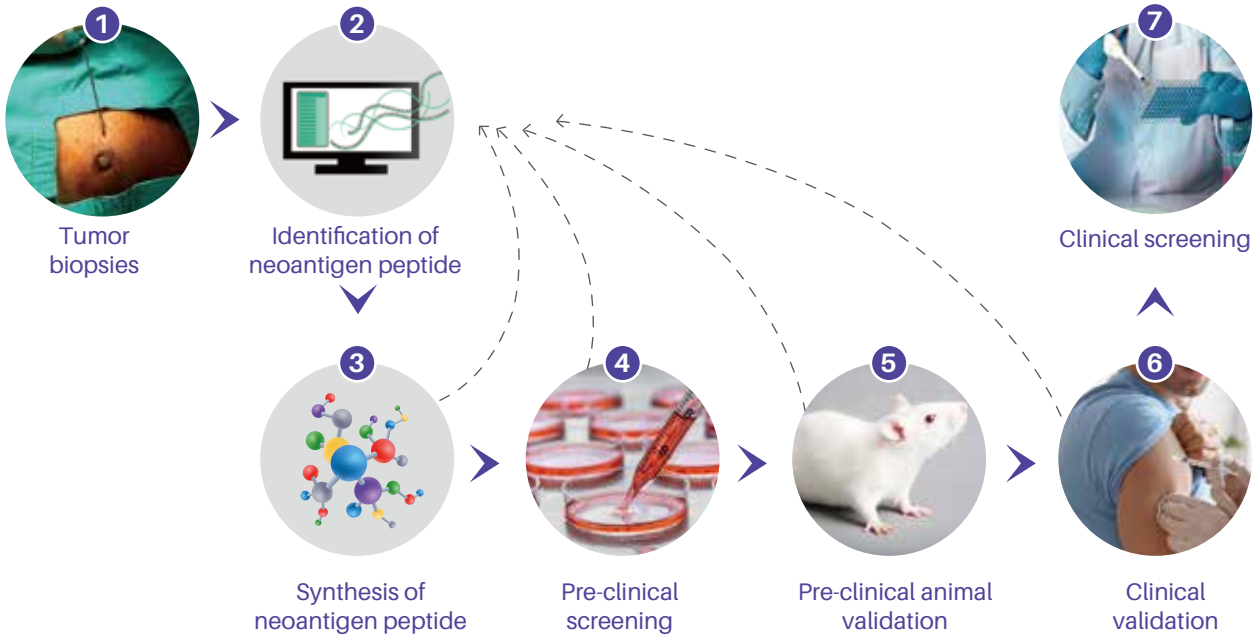
1. Synthesis of Neoantigen Peptide

1.1 Introduction of Neoantigen Peptide

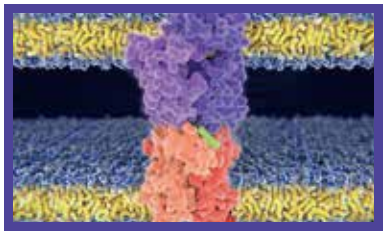
Neoantigens are a series of immunogenic peptides produced by tumor-specific mutations and can be used as biomarker to distinguish cancer cells from normal cells. As neoantigens are specific to the tumor cells, they do not induce central and peripheral tolerance and are safe targets when used in tumor immunotherapy.

With rich experience in peptide synthesis, GenScript provides neoantigen peptide services, including neoantigen peptide synthesis, process development, neoantigen peptide pooling services, neoantigen peptide library synthesis services, and has developed professional peptide evaluation tools to assist in the design of neoantigen peptides.

◆ Neoantigen Precision Immunotherapy Process



◆ Application of Neoantigen Peptide



TCR- screening for antigen affinity and immunogenicity

Personalized Cancer Vaccine (PCV)

PCV efficacy screening

1.2 Service Features

Independent production line Quality assurance

Professional assessment tools to assist in peptide design

Service flexibility to match applications

Economical

1.3 Service Details

Service Type	Delivery Specification	QC Testing Services
Synthesis of neoantigen peptide Construction of a peptide library of neoantigen peptides Peptide pool service of neoantigen peptides	Length: 5-30AA Purity: Crude product - ≥98% Quantity: mg and above Delivery time: as fast as 5 days Delivery form: Lyophilized powder	HPLC MS Dissolution test service TFA removal service Endotoxin control/removal Cross-contamination control
Process development of neoantigen peptides	Customized process development services were provided based on customer projects	

1.4 Case Sharing

• TCR-screening for Antigen Affinity and Immunogenicity

Solutions / Research Steps	Customer Needs	Tool Analysis	Analysis of Results	Response Strategies
In vitro functional screening	Synthesis of 300 neoantigen peptides	Peptide Assessment Tool	78% for simple sequences 22% for difficult peptides	PepPower™ platform; Synthesis of difficult peptides by manual synthesis
Confirmation of affinity sites	Synthesis of 100 overlapping peptide libraries Delivered in peptide pools	Peptide Library Design Tool	-	PepHTS™ platform
Confirmation of key sites affecting affinity	Synthesis of alanine screening library	Peptide Library Design Tool	-	PepHTS™ platform

• Pharmacodynamic Screening of PCV

Solutions / Research Steps	Customer Needs	Tool Analysis	Analysis of Results	Response Strategies
In vitro functional screening	Synthesis of 150 neoantigen peptides	Peptide Assessment Tool	68% for simple sequences 22% for difficult peptides	PepPower™ platform; Synthesis of difficult peptides by manual synthesis
Preclinical *in vivo* validation	Synthesis of 20 high purity neoantigen peptides	Peptide Assessment Tool	30% for simple sequences 70% for difficult peptides	
Additional efficacy verification	Synthesis of 30 neoantigen peptides	Peptide Assessment Tool	35% for simple sequences 65% for difficult peptides	

2. Cyclic Peptide Synthesis

2.1 Introduction to GenScript's Cyclic Peptide Synthesis

Cyclic peptides are commonly used for diagnostics and vaccine development. Compared with straight-chain peptides, cyclic peptides have better conformational stability, target affinity, and improved selectivity. GenScript now offers compressive types of cyclic peptides up to kg levels to help accelerate your peptide therapeutic development projects.

2.2 Service Features

Track Records

- **Thousands** of cyclic peptides delivered each year
- **9** cases of process development projects
- **2** cases of IND (CMC) projects

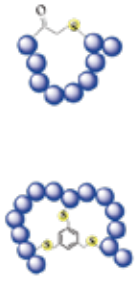
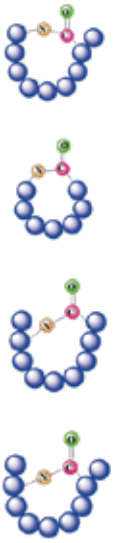
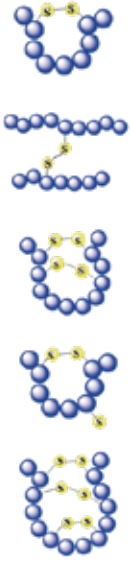
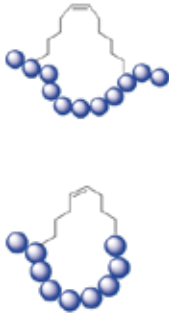
Proprietary Technology Platforms

- PepPower™ & PepHTS™ proprietary platform
- **>20** types of cyclization

Industry-leading speed

- Deliver in as fast as **6** business days*

2.3 Service Details

Thioether bond	Amide bond	Disulfide bond	Staple peptide	Triazole moiety	Other bonds
					

Types	Sequence Length	Quantity	Purity**	QC Reports	Free Solubility Testing	TFA Removal	Add-on Service Options
One Disulfide Bond	10-60AA	μg to kg	≥70% to ≥98%	MS and HPLC for cyclization verification	Free for Ultrapure water, 1 × DPBS(pH 7.1±0.1), DMSO	Standard & Guaranteed Service	• Endotoxin control & analysis • Nitrogen analysis • Amino acid analysis • Moisture content analysis NMR analysis • HPLC-UV-fluorescence • Residual solvent testing • and so on.
Two Disulfide Bonds	Up to 35AA						
Three Disulfide Bonds		μg to mg					
Bicyclic	Up to 30 AA						
Click							
Stapled Peptide							
Dimer	Up to 40 AA						
Thioether							
Head to Tail Cyclization	Up to 50 AA	μg to kg					
Side chain to Side Chain Cyclization							

*Turnaround time includes all business days from order confirmation to completion, not including shipping time
** Purity indicates the percentage of cyclized peptide in the ratio to the total product.
Note : Enquiries on other types of cyclization are welcome.

Cyclic libraries service consists of head-to-tail cyclic peptides or cyclic peptides with one disulfide bond coming soon.

Synthesis of Cyclic Peptides with GenScript

Challenge:

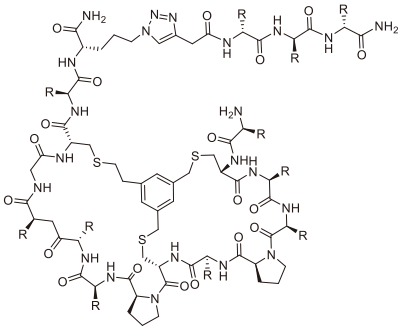
Complex synthesis process connecting three cysteine residues in the sequence and the "scaffold" in the middle through covalent bonds.

Solution:

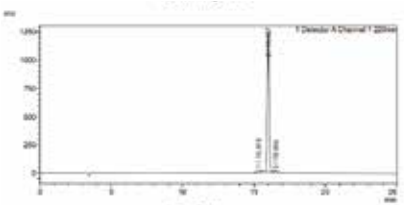
GenScript provided a comprehensive solution that included mature process routes for various symmetric and asymmetric "scaffold" structures, a professional modification team, and a strict testing and release platform to ensure the quality and purity of the synthesized peptides.

Results:

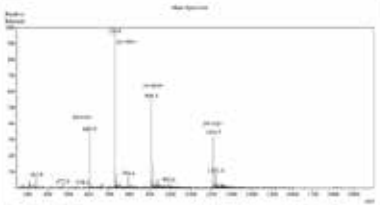
GenScript successfully synthesized the cyclic peptides, meeting the high standards for quality and purity, and supporting drug development projects with confidence.



Bicycle peptide



HPLC



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3. Cosmetic Peptide Synthesis

3.1 Introduction to GenScript Cosmetic Peptides

Cosmetic peptides are bioactive peptides that have efficacious role in cosmetics. Such bioactive peptides have the following characteristics, i) small molecular weight, ii) easily adsorbed, iii) highly efficacious, iv) enhanced skin permeability, v) good stability and vi) highly soluble. With recent significant breakthrough, bioactive peptides are gradually applied in cosmetics, playing a role in stimulating the repair and regeneration of skin cells, and promoting the differentiation of hair follicles.

With over 17 years of experience in peptide synthesis, GenScript can provide custom cosmetic peptide raw material synthesis and formulation stock solution development services, and provide a variety of QC testing services to meet cosmetic R&D needs.

3.2 Service Features

Ph.D. level R&D team
Professional technical support

Multiple QC testing services
Quality assurance

High throughput production platform
Economic and fast

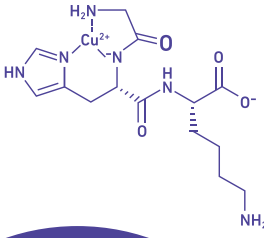
Fully automated production platform
Inter-batch stability

3.3 Service Details

	Purity	Specification	Delivery Form	Documentation	QC testing
Synthesis of raw material	Up to 98% or higher	mg-kg	Lyophilized powder	MS&HPLC TDS MSDS COA	Net peptide content Moisture content Microbial content detection Acetate content Heavy metal content detection
Development of stock solution formula	-	-	Mono-peptide compound		

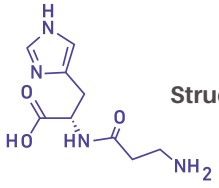
3.4 Popular Products

Copper Tripeptide-1 is a tripeptide discovered in 1973 from serum that binds to copper ions to form a complex with the sequence of glycine-L-histidine-L-lysine. Copper Tripeptide-1 stimulates the proliferation of epidermal stem cells and plays a powerful role in skin repair and rejuvenation, and is known as a "skin care panacea".



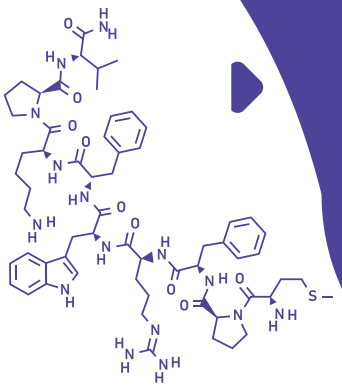
Structural formula of Copper Tripeptide-1

Carnosine, a dipeptide composed of β-alanine and L-histidine, is naturally found in many bodily tissues and is beneficial in the prevention and treatment of diabetic complications. With its abilities to boost the function of the immune system, its anti-aging, antioxidant and anti-glycation properties, it is also known as the "longevity molecule".



Structural formula of Carnosine

Nonapeptide-1 is a bionic peptide consisting of nine amino acids that binds to melanocortin receptor-1 (MC1-R) on the surface of melanocytes and competes to reduce the binding rate of alpha-melanocyte stimulating hormone (α-MSH) and melanocortin receptor-1, thereby inhibiting the activation of tyrosinase and thus melanogenesis, and is called a "whitening peptide".



Structural formula of Nonapeptide-1

4. Peptide Drug Development Process

4.1 Introduction to GenScript Peptide Drug Development

As a high-quality and rapid peptide supplier, GenScript has over 17 years of experience in peptide synthesis and provides you with peptide drug process development. With its own PepPower ™ synthesis platform and professional R&D team, GenScript provides a one-stop solution for peptide drug development and filing, ranging from research and evaluation to lab-scale and pilot-scale production.

Service Type

- Process development of peptide new drugs
- Process development of generic peptide drug

Downstream Application

- Pre-drug screening
- Pharmacological and pharmacokinetic validation
- Prodrug efficacy verification

Service Advantages

- Capacity up to 2 kg/month
- Technology transfer

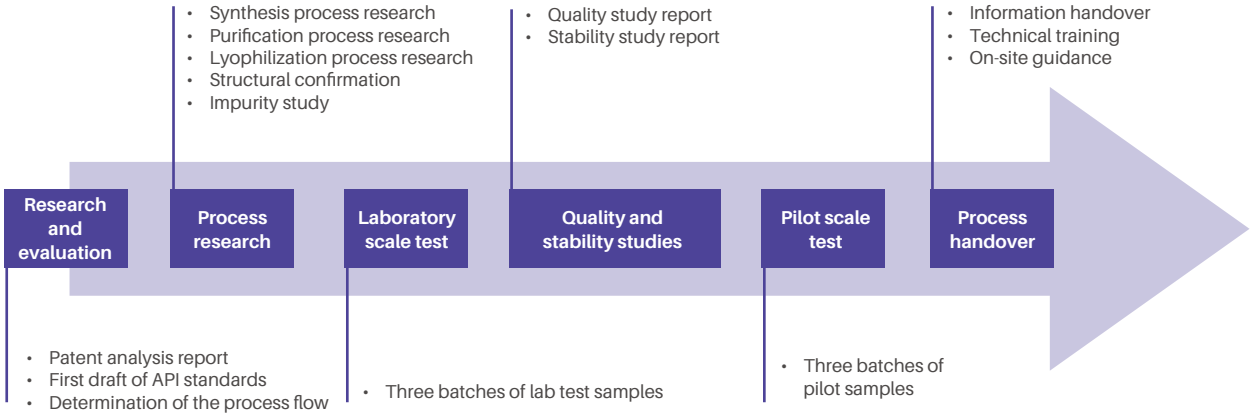
4.2 Peptide Drug R&D Platform

CEM automated microwave synthesizer

DAC purification system

High-resolution mass spectrometer QE

4.3 Peptide Drug Development Process



03

Value Added Services

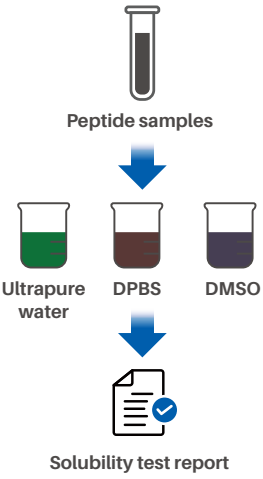
AccuPep+QC Testing Services

All GenScript peptides undergo Total Quality Management testing, including mass spectrometry and analytical high performance liquid chromatography (HPLC) analysis throughout the peptide synthesis and purification processes. In addition, GenScript offers the following QC testing services to meet the needs of specific experimental areas:

- Solubility Test
- Amino acid analysis
- Moisture Content Analysis
- Specific optical rotation
- TFA counter ion removal detection
- Peptide content analysis/ nitrogen analysis
- Stability test
- Peptide sequencing
- Endotoxin control and analysis
- pH measurement
- Counter-ion quantification
- HPLC-UV fluorescence detection

Peptide Solubility Test

Our solubility testing service makes working with hydrophobic peptides easier by taking the guesswork out of peptide solubility. We provide you with a complete, customized dissolution profile of your peptide, including a report containing the gross peptide concentration of your peptide and the solvents your peptide dissolves in best.



Example of Solubility Test Report Form*

SC1634 AccuPep - Qualitative Solubility Test (Free)

Solvent	Results
Ultrapure water	Insoluble
1 × DPBS (pH 7.1 ± 0.1)	Soluble
DMSO	Freely soluble

SC1634-1 AccuPep - Quantitative Solubility Test (New)

Solvent	Results	Cross Peptide Concentration
Ultrapure water	Undissolved	N/A
1 × DPBS (pH 7.1 ± 0.1)	Dissolved	≤15 mg/ml
DMSO	Dissolved	≤20 mg/ml

* Each peptide will be tested for dissolution in a minimum of 3 solvents (ultrapure water, DPBS and DMSO); however, gross peptide concentrations will only be reported for solvents in which dissolution was achieved. Report matrix may vary based on peptide sequences and preliminary solubility test results.

Endotoxin Control & Analysis

Endotoxins (lipopolysaccharides) are major components of the cell walls of gram-negative bacteria, and can be introduced into custom peptide preparations during synthesis. More important, they can stimulate a plethora of unwanted immune reactions in B cells, macrophages, as well as stimulate T cell expansion even at low concentrations. To enhance your experimental results, GenScript now offers custom peptide with guaranteed Endotoxin Control service to reduce endotoxin level at ≤0.01 EU/μg, which is ideal for most of cellular assays.

Delivery Standard

	Endotoxin Level	Delivery Time	Inspection Report
Endotoxin detection (Service No. SC1633)	No guarantee	2 days	Report available
Endotoxin control* (Service No. SC1995)	100% guarantee that the endotoxin is lower than 0.01 EU/μg	2 days	Report available

* Endotoxin control services are only available for regular and express peptide synthesis services (service code SC1208/SC1845/SC1848)

TFA Counter Ion Removal Detection

Trifluoroacetic acid (TFA) is a strong acid, which is commonly used to cleave synthesized peptides from solid-phase resins and is also used to improve HPLC performance in the peptide purification step. Although TFA is important, residual TFA in custom peptides can cause inexplicable discrepancies in subsequent assay data. In general, most custom peptides are delivered as lyophilized TFA salts, and can contain as much as 10%-45% TFA. To improve the study outcome, TFA removal is essential before starting your experiment.

Delivery Standard

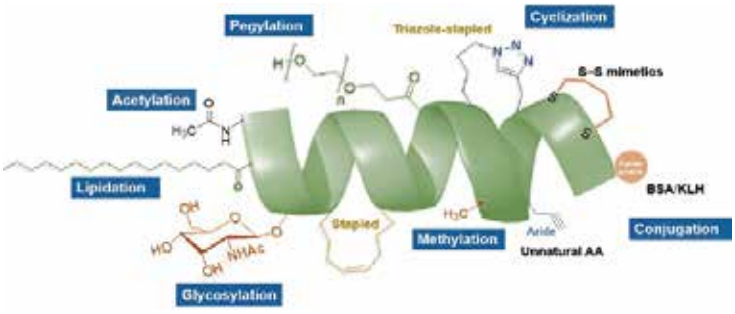
Solvent	Final TFA Counter Ion Content				Report	Lead Time*
	Hydrochloride	Formate	Acetate	Phosphate		
Guaranteed type	<1%	<1%	<1%	N/A	Available	8 days
	<10%				Optional	2 days**

* Business days means the cycle of working days

** If Report is selected for Standard TFA removal service, extra cost and 1 day will be needed

Peptide Modification Services

Peptide modifications present a means to alter the physical structure of the peptide chain or an alteration of the side chain group. With such modifications, it can effectively change the physiochemical properties, improve its solubility, decrease its side effects, improve its immunogenicity and increase its half-life, and so on.



- **Amidation and Acetylation**
  If the synthetic peptide is the internal sequence of a protein, the N-terminus acetylation or C-terminus amidation can remove the charge of the polypeptide to make it more inclined to the natural structure of the protein, while enhancing the resistance of the peptide to endonucleases.

- **Biotin and FITC Labeling**
  FITC (Fluorescein isothiocyanate) is the form of fluorescein used for conjugation to antibodies and purified proteins.

- **Disulfide Bond Modification**
  The formation of disulfide bonds between cysteine residues allows for peptide cyclization.

- **Peptide Phosphorylation**
  Peptide phosphorylation can help study the effect of phosphorylation on the structure of peptides and proteins as well as the mechanism of protein kinases. GenScript has successfully synthesized a large number of phosphorylated peptides on serine, threonine and tyrosine for customers.

- **Methylation Modification**
  Protein methylation is considered an important modification that contributes to the regulation of cellular functions such as transcription, cell division and cell differentiation.

- **KLH,BSA,OVA**
  As a small molecule, peptide antigens cannot produce significant immune response. As such, coupling to larger protein carriers, such as KLH, BSA and OVA is required.

- **Polyethylene Glycol (PEG) Modification**
  PEG-modified macromolecules with high solubility (mainly available for hydrophobic drugs) and bioavailability can enhance the therapeutic effect of peptides by camouflaging them and fooling the immune system of host cells. It may also prolong the metabolism of peptides by decreasing the renal clearance.

- **Isotope Labeling**
  The peptides labeled with ^{2}H, ^{15}N, ^{13}C or ^{15}N and ^{13}C at the same time can be easily detected by NMR after synthesis.

- **(Multiple-Antigen Peptide, MAPs) Modification**
  Multiple-Antigen peptide (MAP) is an effective method for producing highly effective anti-peptide antibodies and peptide vaccines. MAPs use the a- or ε-groups of lysine to form the main chain, and take multiple copies of the peptide antigen as the outer surface layer of the branched synthetic peptide.

04

Peptide Applications

Application Direction

GenScript integrates the advantages of its service platform to launch catalog peptide products with scientific value. All products are HPLC-purified, providing consistent quality and timely delivery. The application scenarios cover the latest hot and most valuable research areas, such as protein purification and detection, disease-related research, immunology, biochemical research, cosmetic peptides, pharmaceutical peptides, and research peptides about SARS-CoV-2, to meet the needs of researchers at different stages. You can buy online by placing an order with one click or consult and leaving a message online to enjoy the customer service staff's timely and professional service.

GenScript offers a wide range of catalog peptides in stock to meet the needs of different applications, mainly focusing on the following major categories:		
• Protein purification and detection GenScript offers a wide range of Tag peptides and protein substrates for antibody preparation, immunology research and other biological research needs	• Related Disease Studies Diabetes, tumor diagnosis related research	• SARS-CoV-2 Peptide Library COVID-19 research, target screening, spot crude peptide libraries
• Immunology and Biochemical Studies Multiple carrier protein cross-linking peptides, such as ovalbumin (OVA), can not only increase the antigen size but also enhance immunity when cross-linked with carrier proteins.	• Pharmaceutical peptides APIs, intermediates, impurities Cosmetic peptides Anti-aging, whitening, hair growth, etc.	• β amyloid peptide Alzheimer's disease (AD)-related proteins

05

Peptide Synthesis Resource Center

Peptide Bioinformatics Tools

Peptide Molecular Calculator

Peptide calculator can display peptide molecular weight, isoelectric point, net charge, average hydrophobicity and other peptide properties for your reference to dissolve peptides.

For more information, please visit:
https://www.genscript.com/tools/peptide-molecular-weight-calculator
or scan the QR code

Peptide Library Design Tool

Seven peptide library design tools are provided to meet your experimental needs in all aspects.

For more information, please visit:
https://www.genscript.com/peptide_screening_tools.html
or scan the QR code

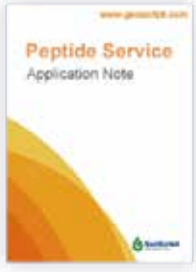
Peptide Assessment Tool

Peptide properties are accurately predicted and assists are provided in peptide design.

For more information, please visit:
https://www.genscript.com/tools/peptide-analyzing-tool
or scan the QR code

Technical Guidance Materials

Peptide Brochure



Peptide Technical Manual

Cell Penetrating Peptides-White Paper

Impact of TFA-Review

Peptide Dissolving Guideline

GenScript also provides manuals and technical guides for these peptides, which can be downloaded and read by visiting GenScript Resource Center

https://www.genscript.com/peptide_technical_resources.html?src=pullmenu or by scanning the QR code on the right

FAQ

1. Custom Peptide Services

Q: What is the TAT for GenScript regular peptide synthesis service?

A: The TAT varies depending on the length and difficulty of the peptide sequence. Regular peptide synthesis takes approximately 2 weeks, while GenScript offers Express peptide synthesis service up to 5-days delivery

Q: How is the purity of peptide calculated?

A: GenScript adopts reversed-phase high performance liquid chromatography (RP-HPLC) to measure the amount of correct peptide relative to the total analytes that absorb at a specified wavelength, typically at 214 nm. In additional to moisture and residual volatile acid that cannot be measured and detected using UV, other impurities include deletion, truncation or incompletely deprotected sequences etc.

Q: What is the net peptide content?

A: It is important to understand the difference between net peptide content and total peptide content. The dry peptide powder shipped to you usually contains not only peptide, but also some other substances such as water, absorbed solvents, counter ions and residual volatile acid. The total peptide content(gross weight) refers to the weight of this mixture. Net peptide weight indicates the actual weight of the peptide component of your sample. Net peptide content is usually 50-80% of the total peptide weight (also called gross peptide weight) and is usually determined by amino acid analysis or UV spectrophotometry. Net peptide content should not be confused with purity. Purity defines the percentage of the target peptide sequence in the peptide component of your sample.

Q: What is the direction of peptide synthesis?

A: Peptide synthesis starts from the C-terminus to the N-terminus of the peptide

Q: What are the applications of peptide libraries?

A: Peptide library is a systematic combination of different peptides in large number. It is widely used in pre-drug screening, target confirmation, epitope mapping, vaccine development, and SAR (structure-activity relationship) studies.

Q: Can GenScript provide branch peptide synthesis?

A: GenScript currently offers two-branch, four-branch and eight-branch peptides.

2. Peptide Storage and Dissolving

Q: How are peptides stored?

A: Normally, the peptide products you receive are lyophilized powder packed. Please store the peptide in a dry, light-proof -20 freezer immediately after receiving the sample to maximize the stability of the peptide. Before use, please place the packing tube containing peptide from freezer to room temperature under dry conditions, and then open the bottle cap after the temperature naturally rises to room temperature. Otherwise, water vapor in the air will enter the sample tube when the cap is opened, reducing the stability of the peptide. Once opened, it should be weighed quickly and sealed immediately to avoid dampness, and special attentions should be paid to hydrophilic peptides to avoid repeated freezing and thawing. The external temperature during short-term transportation does not affect the validity and quality of the peptides.

Q: What is the best way to dissolve a peptide?

A: The solubility of a peptide depends on its amino acid sequence and modifications.
For samples ordered for peptide dissolution testing services, priority is given to following the dissolution test report.

For routine dissolution, there are several recommendations as follows:

(1) Ultrasound helps to the dissolution of peptides

(2) 10% acetic acid helps to dissolve basic peptides

(3) 10% ammonium bicarbonate helps to dissolve acidic peptides

(4) It is recommended that the concentration of stored peptide solution should not exceed 2 mg/ml

For peptides with very low solubility in aqueous solutions, dissolution in organic solvents (e.g. DMSO, isopropanol, methanol, acetonitrile) should be attempted first. Once the peptide is completely dissolved, gradually add water to dilute it to the specified concentration. (Note: Peptides containing amino acids C,M,W dissolved in DMSO will cause oxidation of these amino acids and DMF should be used instead of DMSO)

GenScript offers a free peptide solubility testing service to help you solubilize peptides.

Q: What is an equilibrium ion/counter ion, and what is its role and impact?

A: In chemical terms, a counter ion is an ion in a solution or electrochemical system that has an opposite charge ion. In peptide synthesis, trifluoroacetic acid (TFA acid) is used to cleave peptide from resin, as well as additive in mobile phase of HPLC purification. Specifically, TFA acid can protonate the basic amino acid residues, such as Arg, His or Lys, or uncapped N-terminus of peptide, which leads trifluoroacetate (TFA salt). However, in some cellular assays, large amount of TFA acid or TFA anion may have some undesirable effects. GenScript offers two premium TFA removal services: Guaranteed TFA Removal (Residual TFA anion content < 1%) and Standard TFA Removal (Residual TFA anion content < 10%).

Q: Why do peptide solutions coupled with carrier proteins occasionally look cloudy?

A: The three commonly used carrier proteins are hemocyanin (KLH), bovine serum albumin (BSA) and ovalbumin (OVA). Due to the large molecule, complex structure and limited water solubility of the carrier protein, flocculent suspension will appear in the solution after a few peptides are coupled with the carrier protein, cloudy. Generally, this does not affect its immunogenicity, and the turbid solution can be used for immune responses.

3. Peptide modification

Q: What should one take note of in the design of phosphorylated peptides?

A: GenScript suggests that phosphorylation modifications should be designed within 10 amino acids away from the N-terminus to avoid loss of coupling efficiency.

Q: What is the maximum number of phosphorylation sites that can be included in the synthesis of GenScript peptides?

A: Up to four phosphorylation sites. This is also upon the evaluation of the overall peptide sequence.

Q: What should one take note of for fluorescent modifications in peptides?

A: GenScript recommends adding a linker between the peptide molecule and the fluorescent modification, which reduces the effect of the fluorescent modification on peptide folding and binding to the receptor. However, introduction of linker is not recommended if fluorescent is to be used in quantification of fluorescent tracking in cellular structures.

Q: Why do peptides undergo N-terminus acetylation and C-terminus amidation modifications?

A: Such modifications generate a closer mimic to a native protein.

Q: What are the advantages of PEG-modified peptides?

A: PEG modification is the addition of a polymer (glycol) to the target molecule by covalent bonding. PEG modification enhances the therapeutic effect of peptides by camouflaging them to fool the host cell's immune system and increases the solubility and bioavailability of hydrophobic drugs. It may also prolong the circulation time of peptides by decreasing the renal clearance.

Q: Can D-peptides be made? How many types of natural D-amino acids are there?

A: Sure. There are 19 types of natural D-amino acids. There is no chiral structure for Gly among the natural amino acids, and D-type structures of other natural amino acids are available at GenScript. For more information, visit the official website for the list of special amino acids.

Q: What fluorescent markers can GenScript provide?

A: GenScript offers 5-FAM, FITC, TMR, pNA, AMC, AFC, Dansyl and MCA.
For more information, please visit the website to see the list of GenScript fluorescent modifications.

Q: Which amino acids are commonly used as linkers?

A: Amino acids commonly used as linkers include {Ahx}, {Beta-Ala}, {Gly}, {GABA}, {Ava}.

GenScript Peptide modification services

Citations Published by Customers

In terms of services and products, GenScript have been cited nearly 10,000 times by more than 1,300 international famous academic journals such as Cell, Nature, Science and PNAS. GenScript's peptide synthesis services have been used by a number of world-renowned institutions to publish their scientific achievements, demonstrating once again GenScript's ability to help scientists "Make Research Easy" in the industry.

The following are some scientific articles selected, with a description of how GenScript helps customers with their R&D efforts.

Title: VISTA is a checkpoint regulator for naïve T cell quiescence and peripheral tolerance.

Journal: Science IF: 41.037 (2020)

Doi: 10.1126/science.aay0524 17 Jan 2020

Introduction: To induce T cell tolerance, two doses of 100 mg of 2w1s peptide (GenScript) were intravenously injected on days 0 and 3, followed by analysis on day 7

Title: Phase separation organizes the site of autophagosome formation.

Journal: Nature IF: 43.07 (2020)

Doi: 10.1038/s41586-020-1977-6 05 Feb 2020

Introduction: The peptide synthesis, antibody generation, ELISA, and purification were performed by GenScript.

Title: Evolutionary Persistence of DNA Methylation for Millions of Years after Ancient Loss of a De Novo Methyltransferase.

Journal: Cell IF: 36.216 (2020)

Doi: 10.1016/j.cell.2019.12.012 Jan 2020

Introduction: Peptides were synthesized by GenScript (Piscataway, NJ) or Peptide 2.0 (Chantilly, VA) to > 95% purity.

Title: Interleukin-17A Serves a Priming Role in Autoimmunity by Recruiting IL-1β-Producing Myeloid Cells that Promote Pathogenic T Cells.

Journal: Immunity IF: 22.845 (2020)

Doi: 10.1016/j.immuni.2020.01.002. 4 Feb 2020

Introduction: Active EAE was induced by s.c immunization of mice with 100 mg MOG35-55 peptide (GenScript).

Title: Antibody-mediated delivery of viral epitopes to tumors harnesses CMV-specific T cells for cancer therapy.

Journal: Nat Biotechnol IF: 41.667 (2020)

Doi: 10.1038/s41587-019-0404-8 Apr 2020

Introduction: Peptides used in this study were synthesized with Fmoc chemistry, isolated by HPLC to > 90% purity and validated with mass spectrometry (GenScript).

Title: CDK7 Inhibition Potentiates Genome Instability Triggering Anti-tumor Immunity in Small Cell Lung Cancer.

Journal: Cancer Cell IF: 27.407 (2020)

Doi: 10.1016/j.ccell.2019.11.003 Dec 2019

Introduction: Subsequently, DMSO-conditioned medium or YKL-5-124-conditioned medium were collected and added to above single-cell suspension in a 96-well U-bottom plate in the presence of Ova257–264 peptide (10 mg/ml, GenScript, Cat#RP10611) for 4 days as previously described.

Title: Dendritic cells dictate responses to PD-L1 blockade cancer immunotherapy

Journal: Sci Transl Med IF: 16.761 (2020)

Doi: 10.1126/scitranslmed.aav7431 11 Mar 2020

Introduction: After isolation, DCs were pulsed with OVA peptide 257264 SIINFEKL (GenScript).

Title: An unbiased approach to defining bona fide cancer neoepitopes that elicit immune-mediated cancer rejection

Journal: J Clin Invest IF: 12.784 (2020)

Doi: 10.1172/JCI142823 1 Feb 2021

Introduction: Peptides were custom made with a purity of > 90% (Genscript, Piscataway, NJ) and dissolved in dimethyl sulfoxide (DMSO) at a final concentration of 20 mM. Generation of BMDCs and neoepitope vaccine preparation.

For more customer published articles, visit

https://www.genscript.com/peptide_synthesis_publications.html

or scan the QR code for information

Customer Feedback

"I have been using the peptides from your company since 2004. The high quality standard of your company will keep us hooked, hopefully for the years to come."

— Dr. Miguel Morales, Universidad de Barcelona, Spain

"Throughout my 4 years of post-collegiate study, I have found Genscript to be an extremely valuable service. Whenever our lab designs a new construct, requires site-directed mutagenesis, or is in need of new peptides, Genscript has been there to help. The staff has been overwhelming insightful and responds to each email within 24 hours. I would like to especially thank Kate Liu, our Genscript representative, for continuously processing 4 or more of our rather large orders at the same time. She has even gone as far as to catch a few of my mistakes and brought them to my attention, prior to finalizing the order. Always a friendly and personal experience with Genscript. Keep up the great work!"

— Jeremy Osko, The University of Pennsylvania

"Although I order infrequently I do appreciate the customer service, approx 2-week turnaround time, and rapid delivery to my location. Price is average or slightly lower than average. I have had opportunities to order from other companies at discounts but do not due to concerns about quality. I can depend on GenScript quality."

— Dr. Steven Applequist, Karolinska University Hospital, Sweden

"Screening hundreds of neoantigens in mice to validate the generalizability of SNP-7/8a was a tremendous undertaking that could not have been possible without the diligent efforts of ***GenScript's peptide chemists who were able to rapidly synthesize even the most challenging sequences at the high purity required."***

—Geoffrey Lynn, Ph.D. Avidea Technologies' CEO

"Because immune responses are very specific, it's important to use high quality peptides so you can feel confident that the targets you identify for cell therapies can elicit an immune response. ***We work with GenScript to synthesize thousands of high-quality peptides, including neoantigens, for our assays."***

— Marvin Gee, Co-Founder and Head of Target Discovery at 3T Biosciences

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Memo No. _____

Date / /

GenScript is committed to supporting customer needs and to bringing cutting-edge technologies to labs globally

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