GenScript
Make Research Easy

GenScript

Biologics Development Service

Inspire Innovation

GenScript Biologics CDMO

GenScript is the world leader in biotechnology reagent service industry. Established in 2002 in New Jersey, United States, GenScript has now expanded its business into immunotherapy and biologics CDMO to further fulfill its mission in making people and nature healthier through biotechnology.

GenScript provides an integrated biologics discovery & development solution from target to IND. With our cutting-edge technology platforms in therapeutic antibody discovery & development, GenScript is able to deliver functional antibody lead with good developability and safety in discovery phase, as well as reliable, productive and regulatory-compliant process & drug product for IND filing in development phase, which significantly save client's time and cost.

Lead Generation

- Hybridoma generation
- Human naïve library & Synthetic library
- Fully human transgenic mice
- Single B cell sorting
- SMAB bispecific antibody discovery

Lead Optimization

- Antibody humanization
- Affinity maturation
- Developability assessment
- Bioassay & Bioanalytics

Biologics Development

- Cell line development
- Process development
- Analytical development
- Clinical batch supply

GMP Plant #1
Nanjing, China

GMP Plant #2
Nanjing, China

GMP Plant #3
Zhenjiang, China

- Chinese Leading CDMO
- From Target to Market Solutions
- 400+ Employees, 40+ Experts with extensive experiences in industry
- cGMP compliant Mammalian Cell Culture Facility
- Comprehensive Analytics Platform

PreCMC Cell Pool Development & Developability Assessment

Problems like physical stability and aggregation of biomolecules usually occur in process development and lead to the failure of preclinical development.

Knowing about these potential risks at the start of cell line development can enable you to select the best candidates, mitigate potential risk and optimize the development process, ensuring a rapid and cost effective drug development strategy.

• Recommended for

- Bispecific/multivalent antibody and protein projects
- Have multiple candidates ready for CMC and select a best one to move forwards

• Service Advantages

- Evaluate the developability of drug candidate in the same host cell and vector system as CMC to simulate the actual conditions
- Help to identify the possible risk occurred in the process development
- The cell clone can be further developed to stable cell line

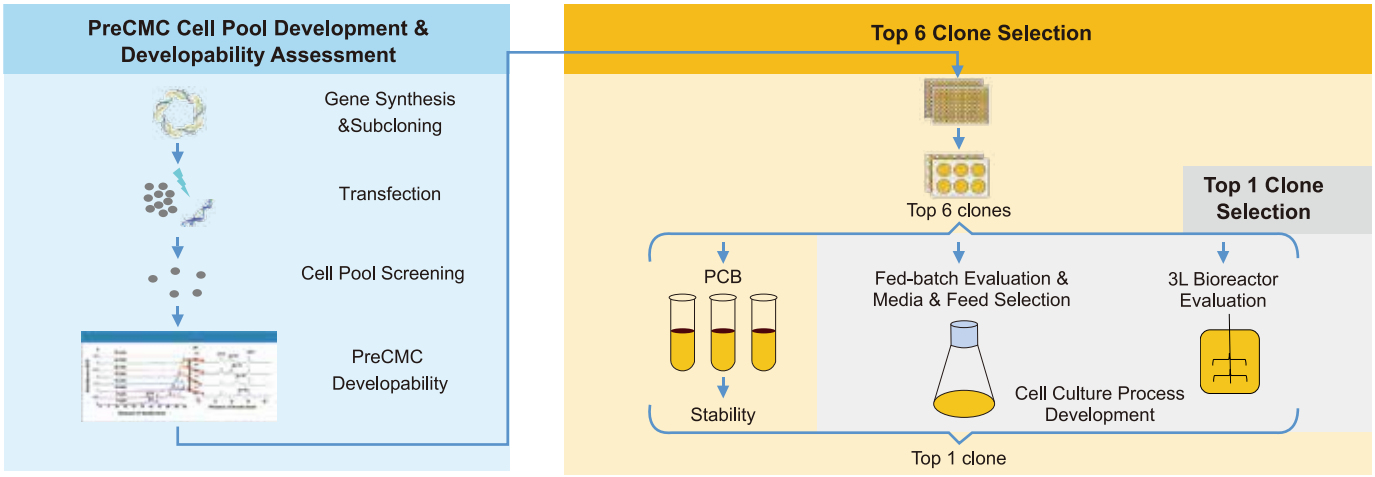
• Service Specifications

Service	Service Content	Service Detail	Deliverables	Timeline (week)
PreCMC Cell Pool Development	Gene synthesis & plasmid preparation	Codon optimized gene synthesis, subcloning into pGenHT1.0 DGV or pGenHT1.0 vector, plasmid preparation.	-pUC57 plasmid -Cryopreserved cells (3 cell pools, 10 vials/pool, 1×10^7 cells/vial) -Cell pool development report	12
	Cell pool screening	12×24-well screening, top 18 cell pools for 6-well batch evaluation		
	Cell cryopreservation	Top 3 cell pools expansion, cryopreservation, cell viability test after cell recovery		
PreCMC Developability Assessment ---Basic	40℃	DLS, UV280, SEC-HPLC, CE-SDS-NR	Report	6-8
	Low pH 3.5	UV280, SEC-HPLC, CE-SDS-NR		
PreCMC Developability Assessment ---Premium	40℃	DLS and DSC, UV280, SEC-HPLC, CE-SDS-NR, iCIEF	Report	6-8
	Low pH 3.5	UV280, SEC-HPLC, CE-SDS-NR, iCIEF		
	Freeze & Thaw	UV280, SEC-HPLC, CE-SDS-NR, iCIEF		

Stable Cell Line Development

Cell line development is the starting point of preclinical CMC. Empowered by GenScript's automatic and high throughput cell line development platform, GenScript is able to deliver the stable cell line ready for preclinical development as soon as 19 weeks. In past 5 years, GenScript has successfully delivered more than 200 cell line development projects and 30 of them are used for biologics development.

• Service Workflow



• Service Specifications

	Service	Service Content	Service Detail	Deliverables	Timeline (week)
Top 6 clones selection	Stable Cell Line Development	Gene synthesis & plasmid preparation	Codon optimized gene synthesis, subcloning into pGenHT1.0 DGV or pGenHT1.0 vector, plasmid preparation.(Biologics standard of material, lab record & report)	-Plasmid construct map; -Stable cell line development final report; -6 PCBs (10 vials/bank)	20-21
		Cell pool screening	12×24-well screening, top 18 cell pools for 6-well batch evaluation		
		Cell clone screening	Top 3 cell pools for total 90×96 well screening by VIPS+ monoclonality image, select top 10-12 cell clones		
		Fed-batch evaluation	Select top 6 clones through fed-batch evaluation		
		PCB generation	6 PCBs(10 vials/cell bank)		
	PCB Stability Study	60-generation stability study	Evaluate cell density, cell viability and target gene sequence	-Report of stability study (60-generation stability)	14-15
Top 1 clone selection	Top 1 clone selection	Media & feed selection	Fed-batch evaluation on top 6 cell clones with 4-6 media & feed combination	-Top 1 clone -Report -Platform process protocol	12
		3L bioreactor selection	Conduct 3 L bioreactor production with platform process on top 6 cell clones to select top 1 clone and back up clone		

High Quality Cell Line

For mAb,
Guaranteed: 3 g/L Average: 3-5 g/L Up to: 8 g/L
Excellent stability in 60 generations' evaluation cycle
Comprehensive product characterization platform

Regulatory Compliance

Background materials of host cell line
Traceable documentation
Monoclonality assurance

Short Development Timeline

Gene to PCB in 4-5 months

IND-Enabling CMC Service

GenScript builds an integrated platform including stable cell line development, process development, analytical development and GMP manufacturing to accelerate your IND journey.

• GenScript's Integrated IND-Enabling CMC Platform

Stable Cell Line Dev.	Upstream Process Dev.	Downstream Process Dev.	Bioassay & Bioanalytics	GMP Scale-up
• Cell pool dev. • Cell line dev.	• Media & Feed Selection • Process development & optimization (Ambr@15 & 3L) • Scale-up (10L & 50L)	• Purification process development & optimization • Virus inactivation/ removal • Formulation development	• Cell-based assay • Cell-free assay • LC-MS analysis • Physiochemical analysis	• DS manufacture (200L, 500L, 2000L) • Fill & finish

• Speed to Clinic: 12 months from DNA to GMP batch

Milestones	Timeline (month)													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stable cell line generation														
PCB stability study (60 generations)														
GMP cell bank generation (MCB, WCB)														
Cell bank characterization														
Stability study of WCB (50 generations)														
Process development														
Formulation study														
Analytical method development & validation														
50L scale-up production														
200L DS & DP production														
DS & DP QC release														
Stability study of DS & DP														

Process Development

GenScript's comprehensive upstream and downstream process development capabilities, commitment to innovation, and high quality of service make us the ideal partner for the process development of your mammalian cell culture projects. In early clinical phases, speed, flexibility, and expertise are critical to quickly establishing a robust and scalable process. Our experts have the experience and capabilities to develop an optimal process with long-term commercial manufacturing in sight, including:

• Upstream Process Development

- Ambr® 15 system for clone screening and exploring the design space in a high-throughput and predictive way.
- DoE covering a wide range of parameters in 3 L bioreactors as a validated scale-down model for manufacturing scale.
- Modeling-based scale-up strategy through bioreactor design, mass transfer, mixing, and shear force.

Shake flasks & MWPs

Clone screening, media screening

- ×30 clones -> Top 6 clones
- 5 basal media × 6 feed media
- Combinations test

1

50 L / 200 L bioreactors

Process scale-up

- Optimal gassing strategy based on mass transfer modelling
- Agitation based on P/V and tip speed
- Optimal and proven bioreactor design

4

2

Ambr®15 microbioreactors

Clone, process parameters, feeding strategy

- ×12 clones × 2 Temp.
- ×2 top clones ×3 pH sp.
  ×4 feeding strategies

3

3 L bioreactors

Process development: CPP-CQA link

- × 2~3 rounds
- × 6~10 bioreactors per round
- Critical parameters: pH, Temp., culture longevity, feeding strategy
- Consistency check (minimal n=3 at 3 L stage)

• Downstream Process Development

• Chromatography

Affinity Chromatography (AC)

Ion Exchange Chromatography (IEX)

Hydrophobic Interaction Chromatography (HIC)

• Filtration

Depth filtration

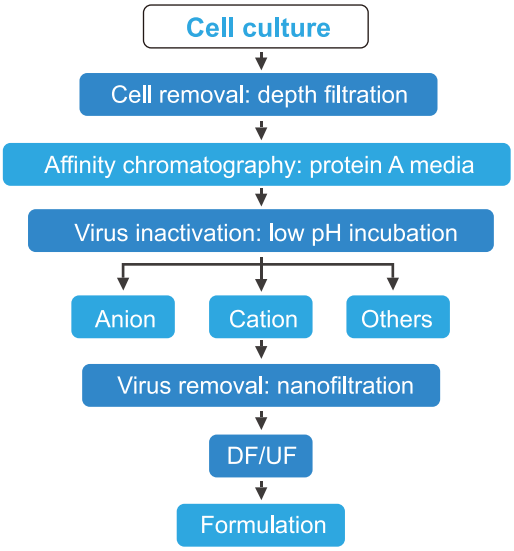
Ultrafiltration and Diafiltration

• Virus Removal

Low pH incubation

Nanofiltration

Chromatography



Platform purification process of monoclonal antibody

Analytical Development

Reliable, robust analytical methods are imperative for successful drug development. Method development, qualification, and validation play pivotal roles in understanding the critical quality attributes of the molecule, which help to define the robust control. GenScript provides a wide range of biophysical, biochemical and functional analytical methodologies for structure characterization, physiochemical analysis, sub-visible particles, multiple functional bioassay and Fc binding assay. With professional scientists and state-of-the-art platform, GenScript provides reliable analytical solutions for all biologics development and manufacturing projects.

• GenScript's Analytical Capability

Primary Structure	Intact Mass
	Reduced and deglycosylated mass
	Peptide mapping with UV and mass
	Spectrometry detection
	Disulfide bond by LCMSMS
	Glycosylated site by LCMSMS
	PTMs by LCMSMS
High Order Structure	CD
	Fluorescence
	DSC

Physiochemical Analysis	nrCE-SDS	Sialic acid
	rCE-SDS	HCDNA(QPCR)
	SEC-HPLC	HCP
	CEX-HPLC	rProtein A
	cIEF	Tween 80/20
	Glycan profiling	Deliverable volume
	Osmolality	Bioburden
Sub-visible Particles	Microflow Imaging Dynamic light scattering	

Functional Bioassay	Tumor cell inhibition / Apoptosis
	Immune checkpoint
	Bispecific
	GPCR
	Neutralization
	T cell stimulation
	ADCC
	CDC
	Mixed Lymphocyte Reaction
	ADCP

Fc Binding Assay	FcγRIIIA (CD16a) 158V
	FcγRIIIA (CD16a) 158F
	FcγRIIA (CD32a) 131H
	FcγRIIA (CD32a) 131R
	FcγRIIB (CD32b)
	FcγRIA (CD64a)
	FcRn
	C1q

• GenScript's Analytical Technology & Equipment

Agilent HPLC/UHPLC
1200/1260/1290

SCIEX TripleTOF™
4600 triple quadrupole
LC/MS/MS

SHIMADZU HPLC
Nexera X2

ForteBio Octet
RED96e System

Q Exactive Mass
Spectrometer

Sciex capillary
electrophoresis P/ACE™
MDQ Plus

Molecular Devices-M2
microplate reader

Bio-Rad GS-900
densitometer

Clinical Material Supply

Early-stage clinical supply of biologic drug substance is produced at state-of-the-art cGMP facilities in Nanjing, China. Your project will be handled by a team of experts with a full range of technologies and analytical tools to not only run the project with the highest flexibility, but also deliver on time with exceptional yields and superior quality.

• GenScript Manufacturing Suites

Plant 1

GMP compliant for IND & Clinical phase 1 material

USP Applikon 3L/10L
DSP GE AKTA pure/avant/pilot/crossflow

USP Thermo fisher 50L/200L SUB
GE XDR 50L and 200L Bioreactors
DSP GE AKTA Process

Plant 2

GMP compliant for Clinical phase 1 & phase 2 material

USP Thermo fisher/GE 200L/500L SUB
DSP GE AKTA Process

GenScript GMP Quality System

Quality Management System

based on ICH and GMP, including 6 sub-systems

Good quality culture from top manager to junior staff

- Experienced team with access to cGMP operation and manufacture know-how
- Reliable GMP facility
  - Physical segregation for each production line
  - Unidirection flow
  - Clean utility meeting global standards
  - All-disposable equipment
  - Automation system
- Quality system compliant to ICH GMP

GenScript CDMO Supporting System

● Project Management

For each project, GenScript will build a dedicated team for clients' project management, including one Project Leader (15 years plus industry experience), one Project Manager (Ph.D holder with 5 years plus experience in Biologics) and scientists as Subproject Managers.

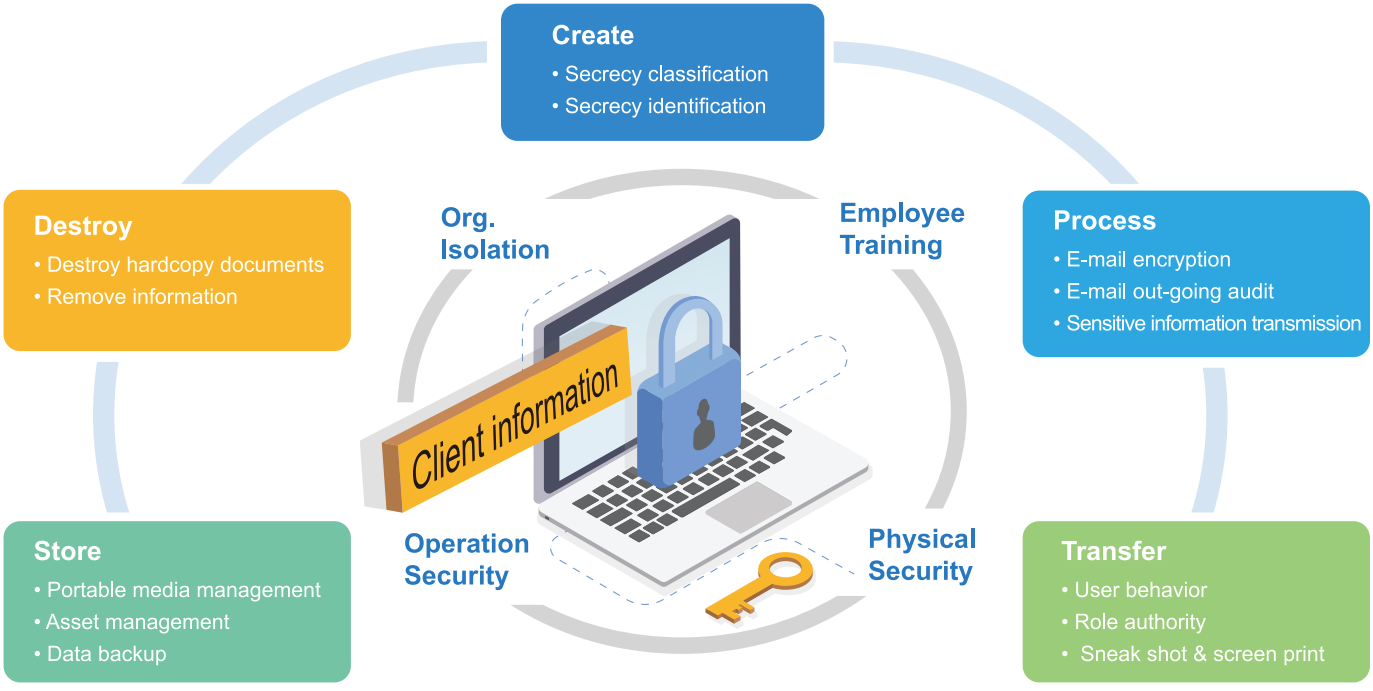
- Breakdown project and assign tasks and process according to content and gantt chart
- Align with the teams on ways to follow up
- Coordinate essential resources

- Project troubleshooting
- Report risks and important issues within 24h to management and customers

- Weekly progress update
- Teleconference every 2 weeks (results update, risk reminder, troubleshooting suggestions)

● IP Protection

At GenScript, we understand and value the importance of clients' intellectual property protection. Focused on client information and based on environment control (including Organizations Isolation, Operation Security, Physical Security and Employee Training), GenScript Customer Information System provides whole-life-cycle information security (including generation, use, transmission, storage and destruction).



www.GenScript.com

GenScript USA Inc.
860 Centennial Ave.
Piscataway, NJ 08854 USA

Email: bioprocess@genscript.com
Phone: 1-877-436-7274
Toll-Free: 1-732-885-9188
Fax: 1-732-210-0262
1-732-885-5878

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