VectorBuilder
Revolutionize Gene Delivery

Product Guide

Vector Cloning | Virus Packaging | Library Screening | Therapeutic IVT RNA | Stable Cell Line Engineering | GMP Manufacturing

About VectorBuilder

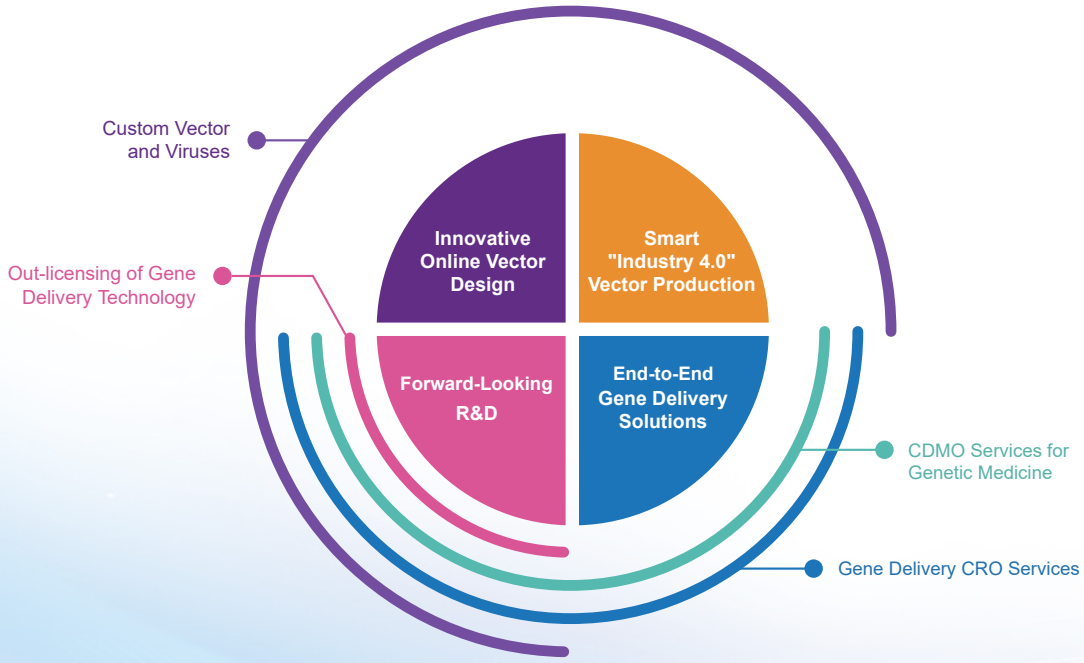
VectorBuilder is a global leader in gene delivery technologies. As a trusted partner in thousands of labs and biotech/pharma companies around the world, VectorBuilder offers a full spectrum of gene delivery solutions covering virtually all research and clinical needs from bench to bedside. Our offerings span several major areas as described below.

- **Custom vectors and viruses:** VectorBuilder is the world's largest provider of custom vectors for both viral and non-viral gene delivery. We currently tailor-make over 80,000 vectors a year for tens of thousands of researchers around the world. Our online platform is a transformative innovation that allows researchers to easily design and order custom vectors online, freeing them from the tedious work of cloning vectors and packaging viruses in the lab.
- **CRO services:** VectorBuilder offers a wide range of CRO services covering diverse gene delivery applications in basic research and drug discovery, including library construction and screening, RNA synthesis, stable cell line generation, safety and efficacy screening, recombinant protein expression, and more. Our high value-added R&D services include AAV capsid evolution, promoter engineering, and experimental codon optimization.
- **CDMO services:** VectorBuilder is a full-service CDMO with extensive experience in cGMP vector manufacturing. Operating several state-of-the-art facilities, we have supported many customers along their entire drug-discovery pipelines, going from research-grade vectors for early discovery, to GMP-like vectors for preclinical testing, to full GMP-grade vectors for clinical trials. Our CDMO services include GMP manufacturing (plasmid DNA, viral vectors, RNA, etc.), process and analytical development, cell banking, fill/finish, and regulatory support. We have recently launched a new GMP product, miniVec™, a miniaturized plasmid with antibiotic-free and supplement-free selection, offering higher plasmid manufacturing and virus packaging yields, improved transgene expression, and an enhanced safety profile.

We strive to offer innovative and high-quality products and services while maintaining rapid turnaround and exceptional affordability. Our "white-glove" customer care is supported by a PhD-level team with decades of collective experience to devise the best gene delivery solutions for our customers.

So we ask you one question:

Would you join us in the gene delivery revolution?



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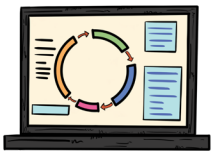

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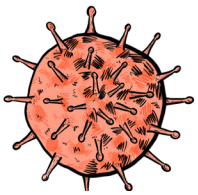

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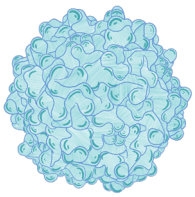

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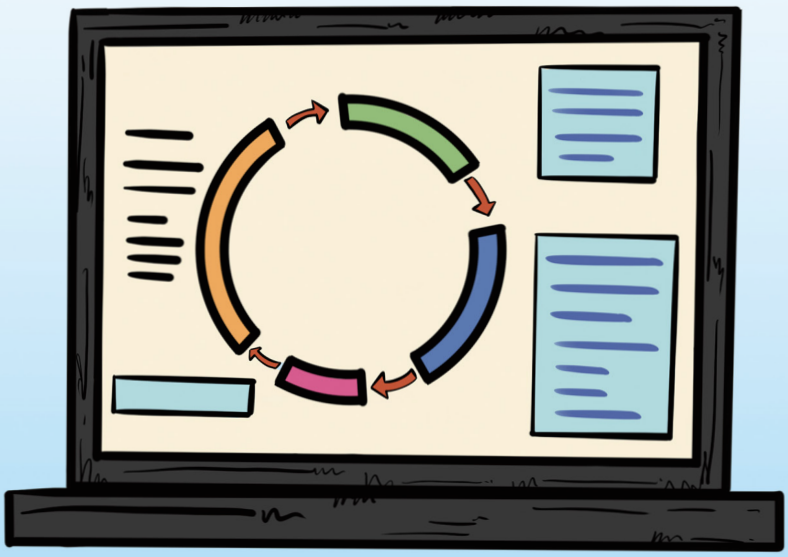
VectorBuilder's Revolutionary Online Platform



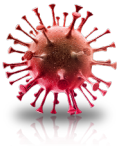
What Can You Do with VectorBuilder?

Design vectors using our intuitive online design platform

Send design requests for complex vector designs or service needs

Order and receive your vectors and viruses in as few as 5 days

A One-Stop Solution for All Your Vector & Virus Needs



Order downstream services (e.g. library construction, BAC recombineering, stable cell line generation, etc.)

Manage your vectors and orders in your VectorBuilder account

Learn to become a vector expert with free and unlimited access to our rich educational content

Highlights

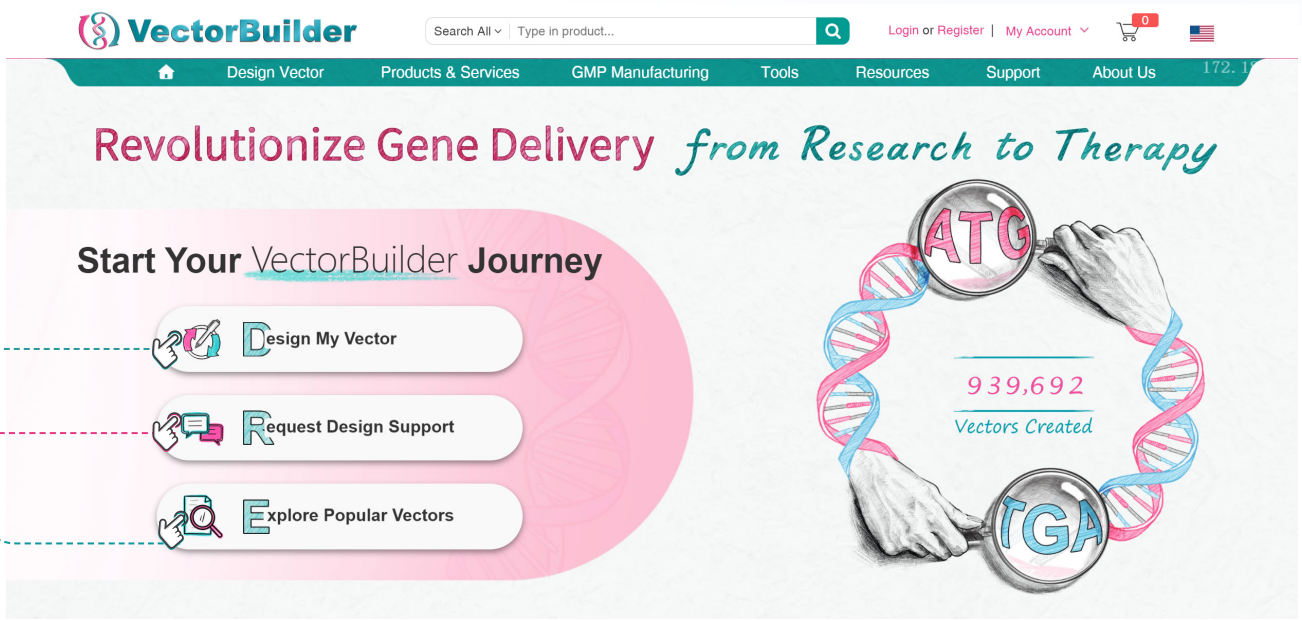
- **Diverse vector systems:** 1,100+ vector backbones for various applications in multiple model organisms
- **Comprehensive collections of vector components:** 400,000+ promoters, ORFs, epitope tags, markers, linkers, peptide signals, and whole-genome shRNA and gRNA databases
- **Bioinformatics tools:** codon optimization, sequence alignment, shRNA and CRISPR target design, and many more
- **Streamlined online shopping experience:** fast checkout, easy order tracking, versatile payment options, and dedicated customer service
- **Highly affordable prices and rapid turnaround**
- **Robust production and comprehensive QC for release**

How to Design a Vector on VectorBuilder

To design a vector, follow the simple steps below.

1 Go to the VectorBuilder.com homepage:

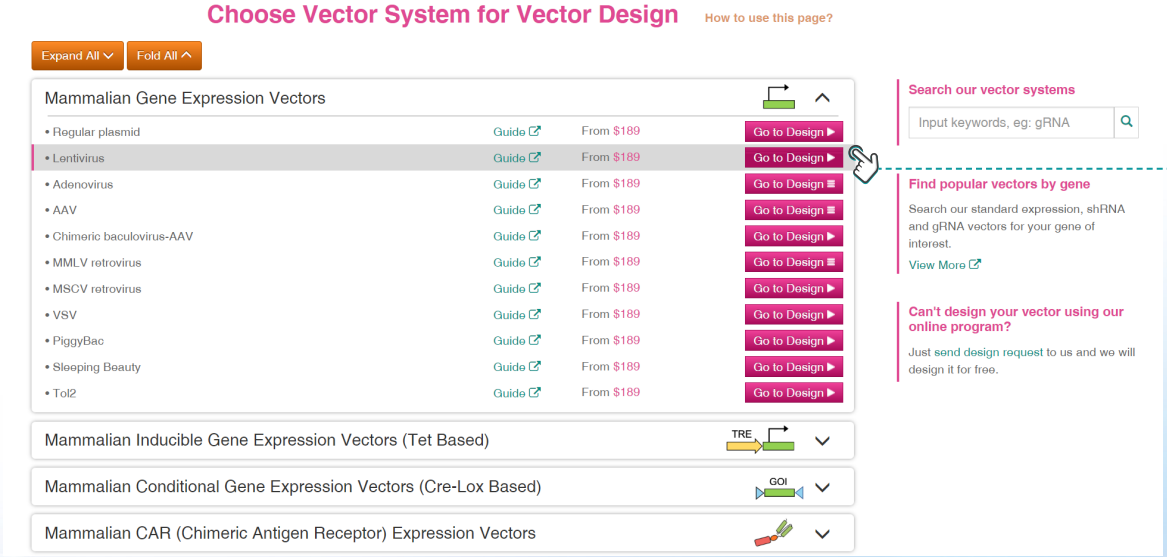
- Click **Design My Vector** to start designing your vector.
- If you can't design your desired vector, click **Request Design Support** to let our scientists create your vector for you.
- Click **Explore Popular Vectors** to search for pre-designed and premade vectors for your genes of interest (GOIs).



2 Next, on the Choose Vector System for Vector Design page:

Choose from 1,100+ vector systems for a wide range of applications in multiple model organisms.

- Overexpression, shRNA, CRISPR, enhancer/promoter testing, in vitro transcription, recombinant protein expression, homologous recombination, etc.
- Mammalian, zebrafish, drosophila, worm, plant, yeast, bacteria, etc.



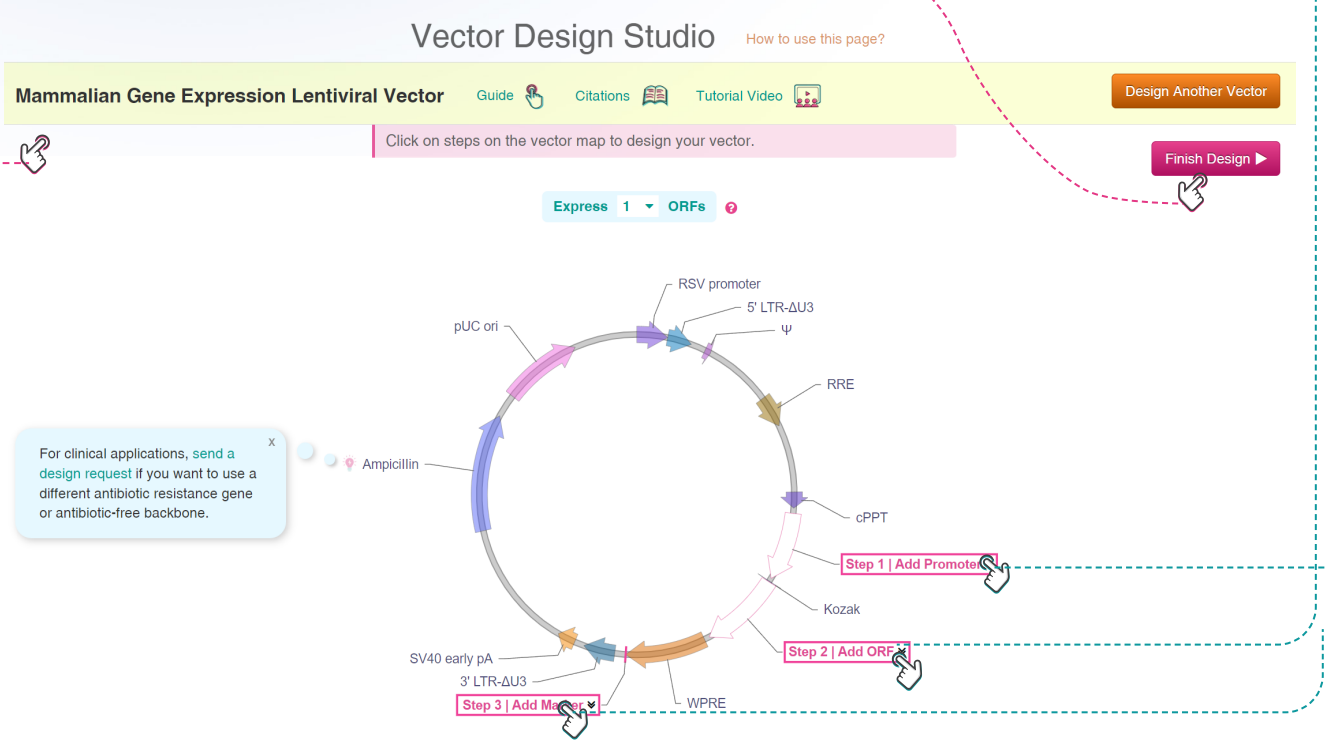
3 Next, on the Vector Design Studio page:

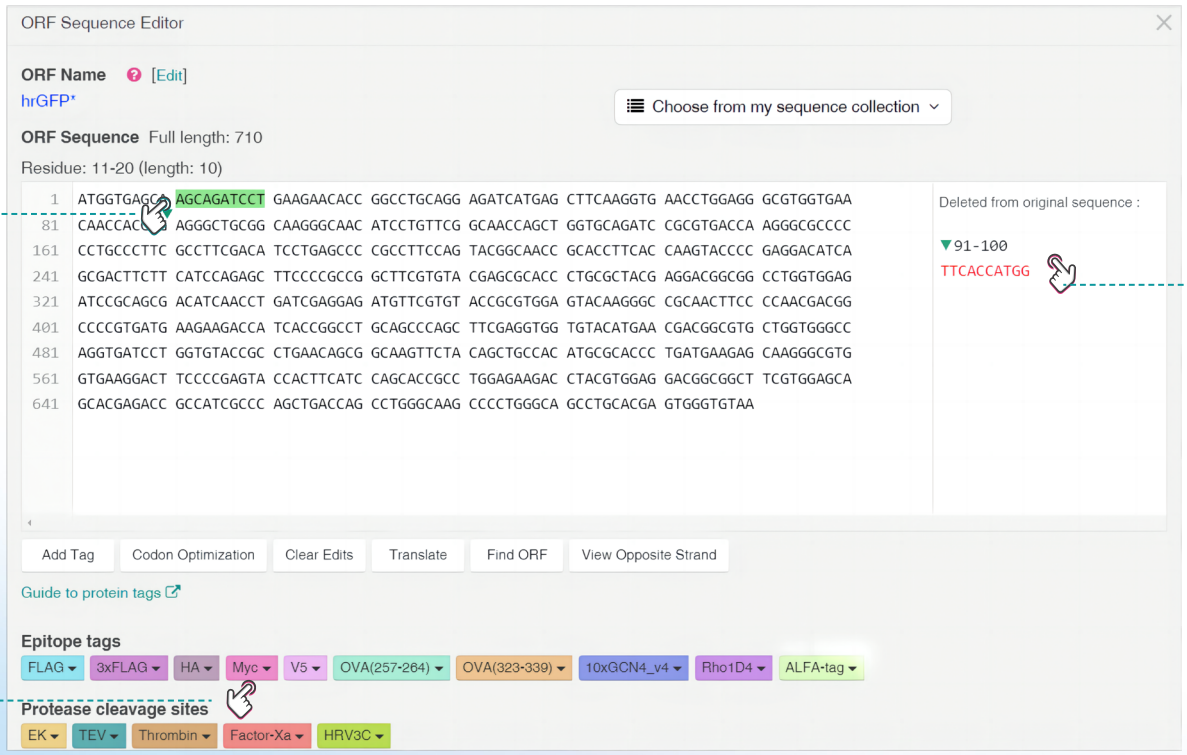
Add your desired vector components, such as promoter, ORF, marker, etc.

You can express up to four ORFs as a single polycistron separated by linkers of your choice, such as 2A or IRES.

You can also edit your ORF to introduce mutations and add epitope tags.

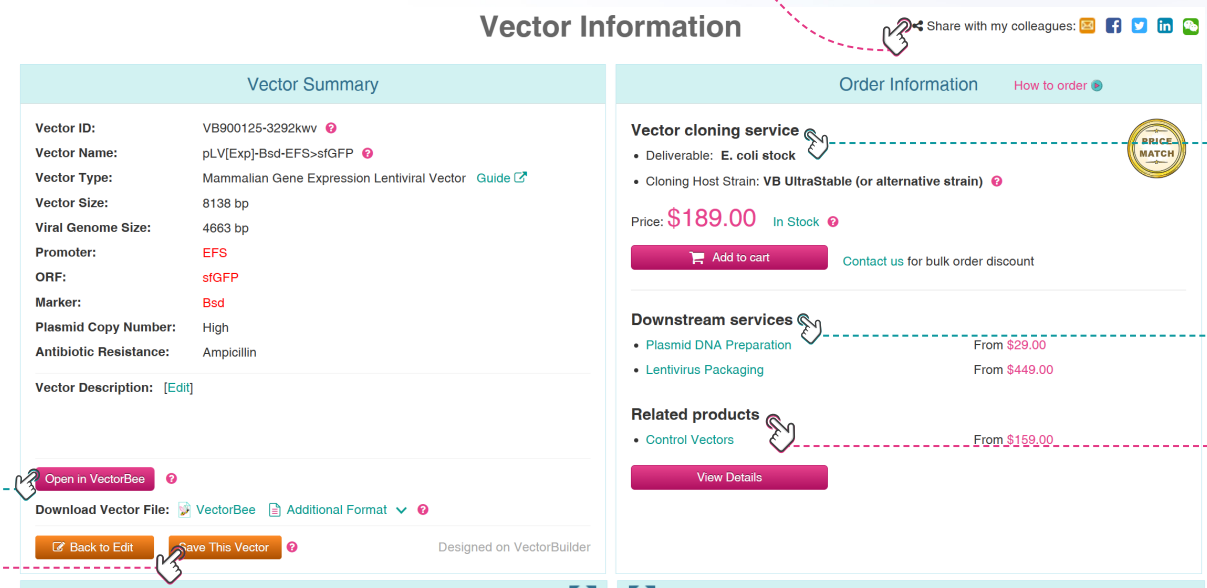
After you have added all the desired vector components, click **Finish Design.**

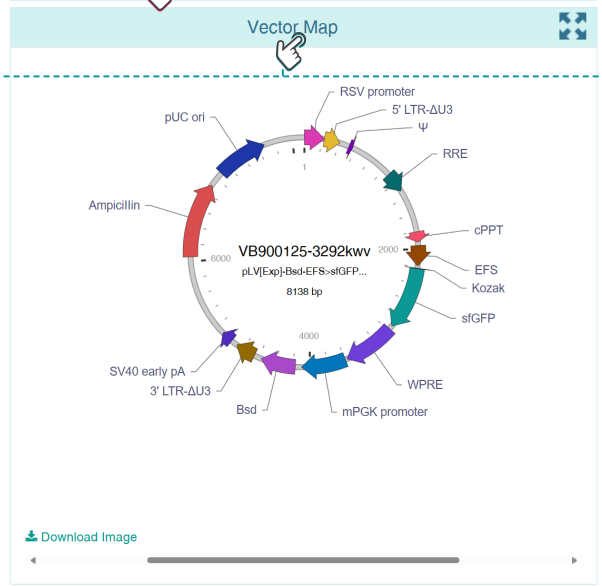




4 Lastly, you arrive at the Vector Information page where you can:

- View complete vector map and sequence with full annotation.
- Order cloning service for the vector and downstream services, such as plasmid DNA preparation and virus packaging.
- Order related products, such as control vectors.
- Save the vector to your account and share it with colleagues.
- Download a vector report in several file formats.

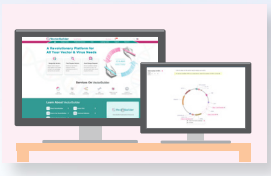




Vector Components

Name	Position	Size (bp)	Type	Description	Application notes	View
RSV promoter	1-229	229	Promoter	Rous sarcoma virus enhancer/promoter	Strong promoter; drives transcription of viral RNA in packaging cells.	View Details
5' LTR-ΔU3	230-410	181	LTR	Truncated HIV-1 5' long terminal repeat	Allows transcription of viral RNA and its packaging into virus.	View Details
Ψ	521-565	45	Miscellaneous	HIV-1 packaging signal	Allows packaging of viral RNA into virus.	View Details
RRE	1075-1308	234	Miscellaneous	HIV-1 Rev response element	Rev protein binding site that allows Rev-dependent nuclear export of viral RNA during viral packaging.	View Details
cPPT	1803-1920	118	Miscellaneous	Central polypurine tract	Facilitates the nuclear import of HIV-1 cDNA through a central DNA flap.	View Details
EFS	1959-2190	232	Promoter	Human eukaryotic translation elongation factor 1 α1 short form	Medium-strength promoter.	View Details
Kozak	2215-2220	6	Miscellaneous	Kozak translation initiation sequence	Facilitates translation initiation of ATG start codon downstream of the Kozak sequence.	View Details
				Superfolder green		

How to Order on VectorBuilder



Design your vector on VectorBuilder.com.

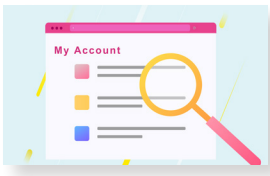
- Design a vector from scratch.
  OR
- Send a design request to our experts.

View your final vector design on the Vector Information page.

- View price and turnaround.
- Add the vector to your shopping cart.
- Add downstream services, such as plasmid DNA preparation and virus packaging.

Open the Shopping Cart page and place your order.

- Get an official quote and use it to place your order by PO.
  OR
- Purchase directly with a credit card or use store credit.



Track your order online.

- Monitor the production status and get the estimated completion date for your order.
  OR
- Contact our project managers to get detailed updates on your project.

Receive your vector shipment.

- Your vector is sequence verified.
- Your virus titer is fully validated.

Account Management and Online Tracking

Home > My Account > My Business > Orders

My Saved Designs
- Vectors
- Service Proposals

My Inquiries
- Price Inquiries
- Design Requests

My Business
- Quotes
- Orders
- Invoices
- Order Requests
- Store Credit

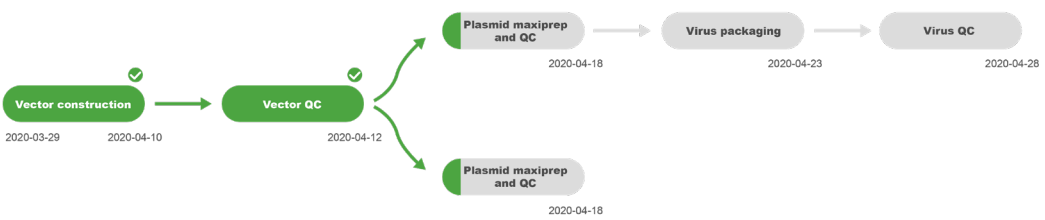
My Information
- Message Center
- Profile
- Address
- Credit Card

Orders

Bulk Actions | See All | Enter ID | Search

Sales Order #	Project Tracking #	Price (USD)	PO File	Payment	Date Last Updated	Status	Tracker	Monday Tracker
S200329-1012qgy	T200328-1017fcd	$1,737.00			2020-03-29	In Production	Track	
S200223-1002jes	T200218-1014jkp	$1,973.00			2020-03-12	Completed	Track	

Project Timeline



Download VectorBee

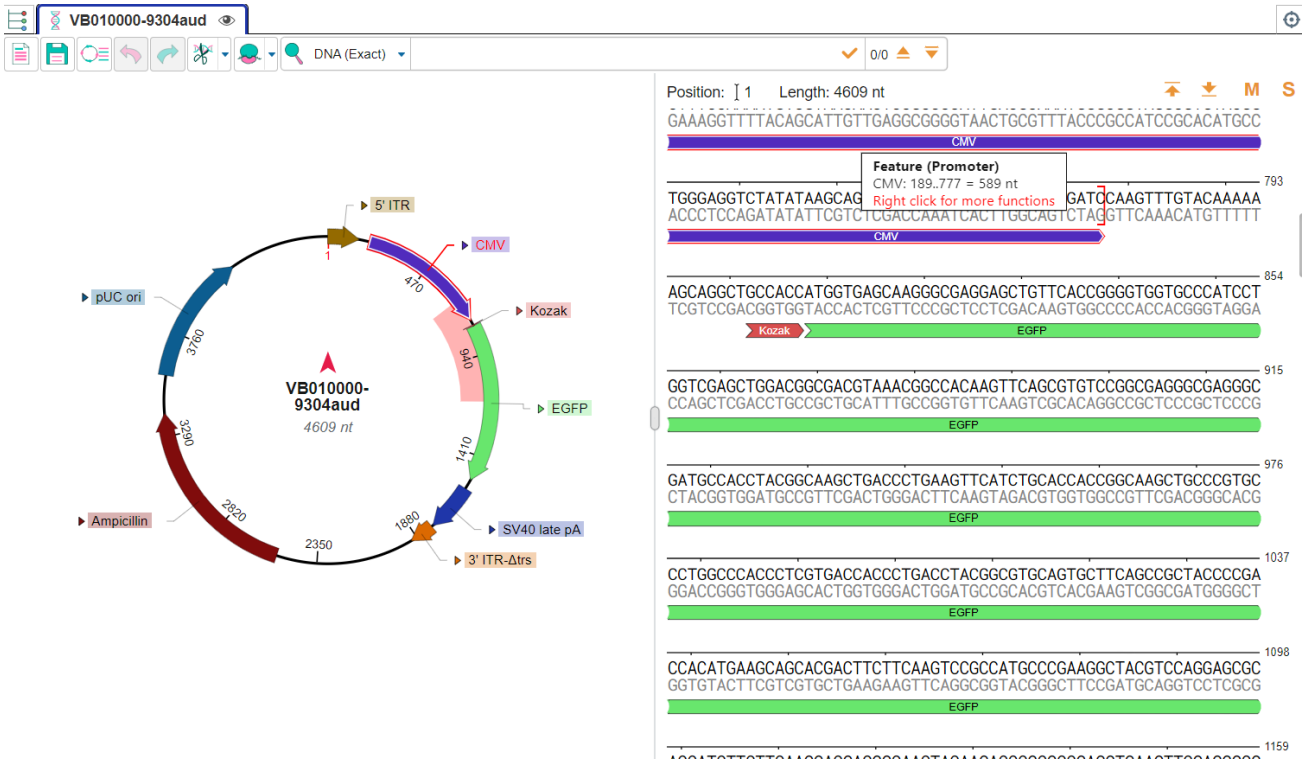
VectorBuilder Free DNA Software

VectorBee

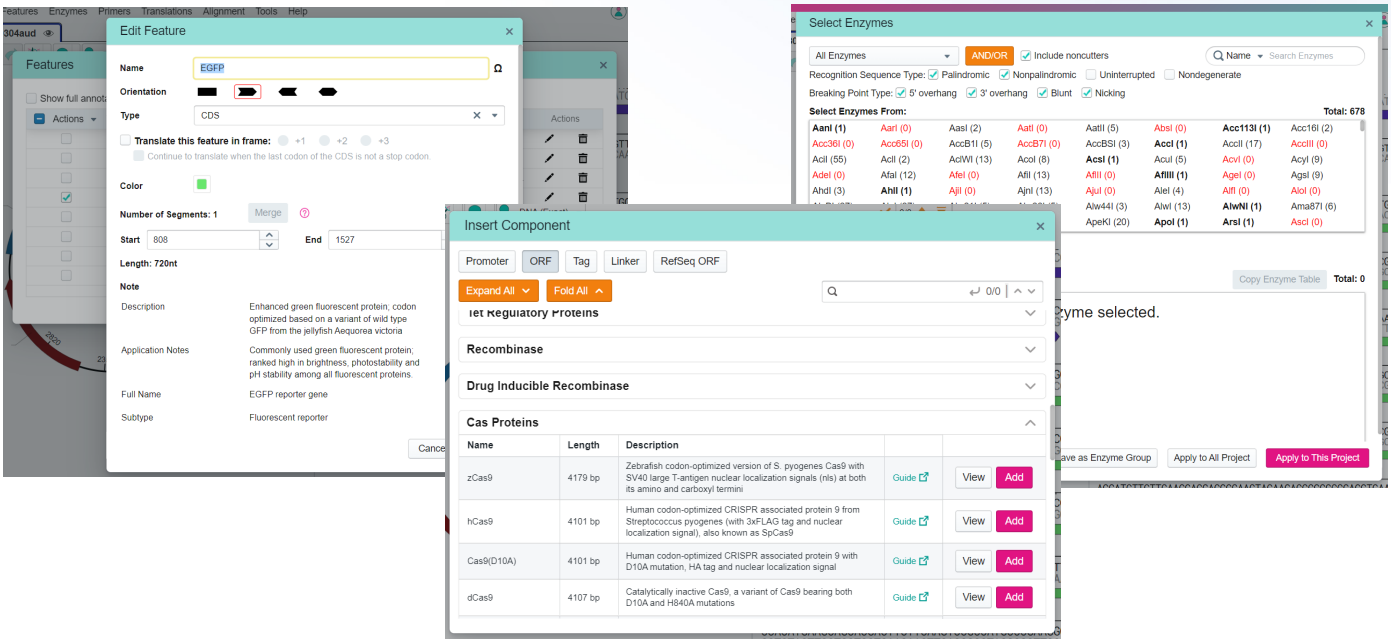
VectorBuilder Free DNA Software: VectorBee

VectorBuilder's talented team of biologists and IT specialists has developed a DNA software, VectorBee. The software's user-friendly interface enables easy design, editing, and analysis of DNA or RNA sequences. This allows quick and easy design and ordering of fully customized vectors for a variety of gene delivery needs.

Available in both Windows and Mac versions, VectorBee offers key features for vector visualization, editing, and analysis, combined with the ease of design offered by VectorBuilder's Vector Design Studio. Users can recognize, add, and edit features as well as insert components like promoters, ORFs, and markers. VectorBee meets complex and customized vector design needs from design, through production, to analysis.



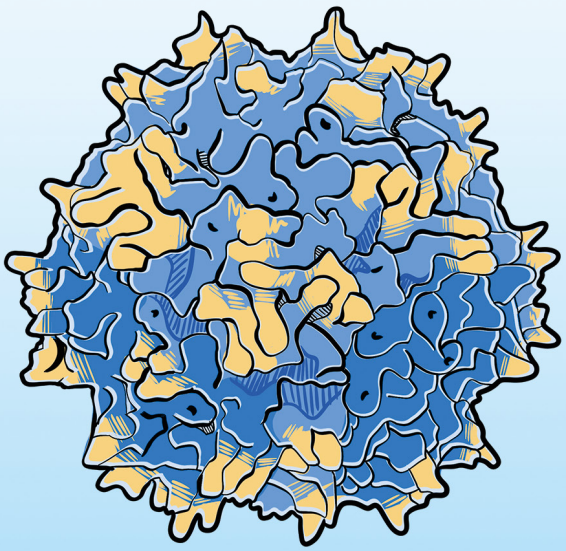
Download VectorBee

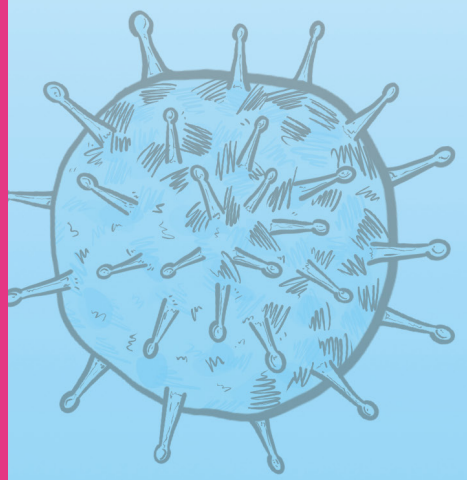


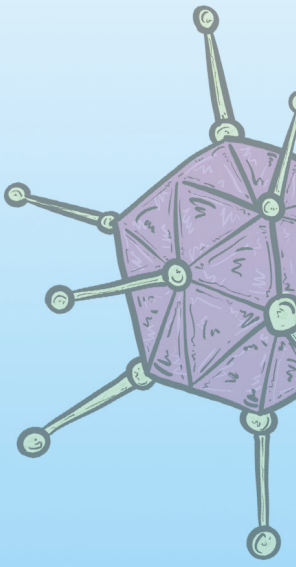
Highlights

- Explore popular vectors from multiple vector systems, including control vectors
- Import vectors directly from VectorBuilder using vector ID or saved vector list
- Organize vectors in the Project Dashboard, including binder creation and file editing
- Automatic detection of common features
- View all features in the feature list to edit individually or in bulk
- Copy and paste features, including sequence and attributes
- Create primers, highlighting length, melting temperature and GC content
- Simulate restriction enzyme digestion with a catalog of almost 700 restriction enzymes
- Insert components, including Promoter, ORF, Tag, and Linker
- Send Design Request directly to the VectorBuilder team

Research Vectors & Viruses







Vector Cloning

As the world's leading provider of custom DNA vectors, VectorBuilder can clone virtually any vector tailored to your research needs.

Highlights

- 1,100+ vector backbones for various applications in multiple model organisms
- Comprehensive inventory of vector backbones and components, including promoters, ORFs, epitope tags, markers, linkers, peptide signals, and whole-genome shRNA and gRNA databases
- Functionally validated vector backbones and components to provide reliable experimental results
- Utilization of versatile cloning technologies for generating vectors with simple or complex designs
- Expertise in delivering highly challenging cloning projects
- Availability of various downstream services, including plasmid DNA preparation and virus packaging
- Robust production and stringent QC for release
- Free vector storage for up to 6 months
- IP of custom vectors is owned by customers

Detailed descriptions of our vector cloning services, including ordering information, are available on the VectorBuilder website under ***Products & Services****.*

Price and turnaround

Our custom vector cloning workflow typically consists of three parts: QC of customer-supplied materials (if applicable), sourcing of required vector components (if applicable), and the actual vector cloning step. VectorBuilder offers top-quality cloning services at unbeatable prices and with rapid turnaround times every step of the way.

Vector cloning starts at just **$139**

in as fast as 3 days

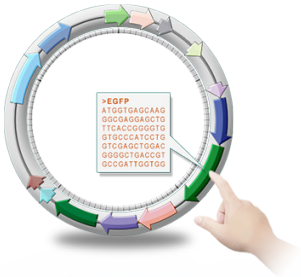


Table 1. Overview of price and turnaround for custom cloning

	Vector cloning*	Vector component sourcing (if applicable)			QC of customer-supplied materials (if applicable)	
Type	Depends on the complexity of vector design	In-stock template	Customer-supplied template	De novo gene synthesis	As vector backbone	As source for vector component
Price	a. For shRNA, gRNA, and short fragment expression (e.g. enhancer, promoter): starting at $149 b. For protein expression: starting at $139	$0-$50 for most templates	$0	Refer to Table 3	$150	Starting at $150
Turnaround**	1-3 weeks for >80% of the projects	Immediately available	Immediately available after passing QC	Refer to Table 3	3-5 days	
Details	Cloning methods include PCR, ligation-based cloning, Gibson, Gateway, and Golden Gate cloning.	In-stock templates include promoters, ORFs, markers, linkers, and protein tags.	Customers can send vector components and/or plasmids	About 20% of projects need de novo gene synthesis.	QC includes quantification, re-transformation, plasmid prep, RE digestion, and Sanger sequencing.	

* Vectors built with VectorBuilder's standard backbones and components have a flat price and turnaround based on Table 2 below.

** The cloning turnaround refers to the time from production initiation to completion. It does not include transit time and QC of customer-supplied materials and transit time for shipping of final deliverables to the customer.

Table 2. Price and turnaround for simple vector cloning

Vector type	Price	Turnaround
shRNA vector	$149	4-7 days
CRISPR vector (single gRNA)	$149	
CRISPR vector (dual gRNA)	$329	6-12 days
Expression vector	$139	3-6 days

Table 3. Price and turnaround for de novo gene systhesis

Fragment length	Price*	Turnaround
<1.5 kb	$0.12/bp	5-10 days
1.5-3 kb	$0.14/bp	10-15 days
3-5 kb	$0.17/bp	10-20 days
5-8 kb	$0.21/bp	

* The de novo gene synthesis fee may be higher when: 1) the fragment contains regions that are difficult to synthesize, such as high GC content, simple repeats, or segmental repeats; 2) fewer than three DNA fragments are synthesized.

Vector Systems Offered Online

	Regular plasmid	Lentivirus	Adeno-virus	AAV	Retrovirus (MMLV and MSCV)	VSV	PiggyBac	Sleeping Beauty	Tol2
Mammalian Gene Expression Vectors	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mammalian Inducible Gene Expression Vectors (Tet-Based)	✓	✓		✓			✓		
Mammalian Conditional Gene Expression Vectors (Cre-Lox Based)	✓	✓	✓	✓			✓		✓
Mammalian CAR Expression Vectors	✓	✓			✓		✓	✓	✓
Mammalian Antibody Expression Vectors (Heavy and/or Light Chain Expression)	✓						✓		
Mammalian Non-Coding RNA Expression Vectors	✓	✓	✓	✓	✓		✓		✓
Mammalian shRNA Knockdown Vectors (U6 and miR30-Based)	✓	✓ (U6-based inducible available)	✓	✓			✓		✓
Mammalian CRISPR Gene Editing Vectors (Single or Dual gRNA +/- Cas9 Coexpression, Cas9 Expression)	✓ (donor, tRNA-gRNA available)	✓ (tRNA-gRNA available)	✓	✓ (donor vector available)			✓ (tRNA-gRNA available)		
Mammalian CRISPR Gene Regulation Vectors (CRISPR Activation and Inhibition)		✓	✓ (activation only)						
Enhancer/ Promoter Testing Vectors (In vitro and In Vivo)	✓						✓ (in vivo only)		
Zebrafish Gene Expression Vectors									✓
Zebrafish CRISPR Vectors (gRNA +/- Cas9 Coexpression or Cas9 Expression)									✓

Vector system	Vector type
Drosophila Vectors	pattB, pUAST, pUASTattB, pUASTB
Plant Vectors	T-DNA binary vector, regular plasmid
Worm Gene Expression Vectors	Regular plasmid, ttTi5606 locus expression vector
Worm CRISPR Gene Editing Vectors	For gRNA and Cas9 co-expression, gRNA expression and Cas9 expression
Recombinant Protein Expression Vectors	Bacteria - pET, pBAD, cold-shock induced
	Yeast - Pichia pastoris, Saccharomyces cerevisiae
	Insect - Baculovirus transfer vector (single and dual promoter)
In Vitro Transcription Vectors	For mRNA, in situ hybridization and small RNA

Plasmid DNA Preparation

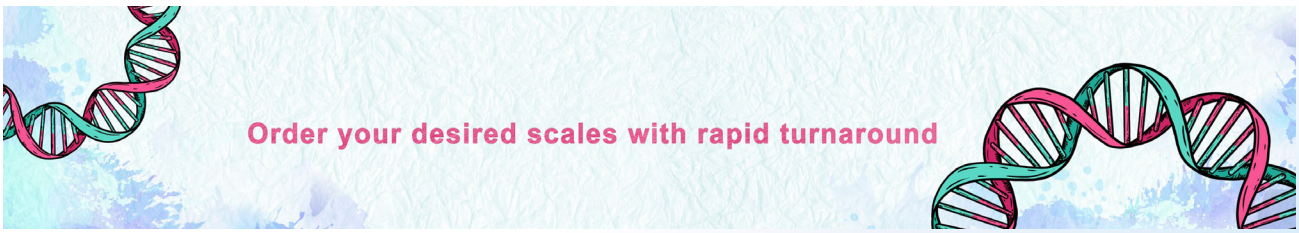
High-quality plasmid DNA is integral to a wide range of molecular biology techniques, from cloning and transfection to virus packaging and protein production. VectorBuilder's plasmid DNA preparation service offers rapid, cost-effective production on a customizable scale, from micrograms to grams, to meet the needs of basic research scientists and industrial customers. In addition to the Research-grade, Research Plus-grade and Industrial-grade plasmids below, we also offer GMP plasmid manufacturing for clinical applications.

As part of our GMP offerings, we recently launched miniVec™, a miniaturized plasmid with antibiotic-free and supplement-free selection, offering higher plasmid manufacturing and virus packaging yields, improved transgene expression, and an enhanced safety profile. See page 48 for more detailed information on miniVec™.

Detailed descriptions of our plasmid DNA preparation services, including ordering information, are also available on our website under ***Products & Services.***

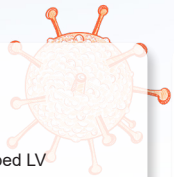
Price and turnaround

<table>
<tr><th rowspan="2">Grade</th><th rowspan="2">Scale</th><th rowspan="2">Application</th><th colspan="2">Deliverable</th><th rowspan="2">Price</th><th rowspan="2">Turnaround</th></tr>
<tr><th>High copy plasmid</th><th>Medium/low copy plasmid</th></tr>
<tr><td>Research</td><td>Mini</td><td>Cloning and various molecular biology experiments</td><td>>200 ng/ul, 50 ul</td><td>>100 ng/ul, 50 ul</td><td>$39</td><td>1-2 days</td></tr>
<tr><td rowspan="4">Research Plus</td><td>Midi</td><td rowspan="4">Various cell culture (e.g. transfection, virus packaging, protein expression, in vitro assays) and in vivo experiments</td><td>>1 ug/ul, 100 ul</td><td>>500 ng/ul, 100 ul</td><td>$99</td><td rowspan="3">2-4 days</td></tr>
<tr><td>Maxi</td><td>>1 ug/ul, 300 ul</td><td>>500 ng/ul, 300 ul</td><td>$149</td></tr>
<tr><td>Mega</td><td>>1 ug/ul, 1 ml</td><td>>500 ng/ul, 1 ml</td><td>$249</td></tr>
<tr><td>Giga</td><td>>1 ug/ul, 10 ml</td><td>>500 ng/ul, 10 ml</td><td>$799</td><td>5-7 days</td></tr>
<tr><td>Industrial</td><td></td><td>Preclinical experiments (e.g. efficacy and safety profile studies) and large-scale production of recombinant protein, virus, and IVT RNA for industrial applications</td><td>100 ug-1 g</td><td>100 ug-1 g</td><td colspan="2">Please inquire</td></tr>
</table>



Virus Packaging

VectorBuilder offers recombinant virus production services for a wide range of virus types with super affordable prices. Our production technology and reagents are optimized to achieve the highest quality of research-grade, GMP-like and GMP-grade virus in terms of titer, purity, potency and consistency. VectorBuilder offers over a dozen different types of recombinant viruses. The major ones are listed below.

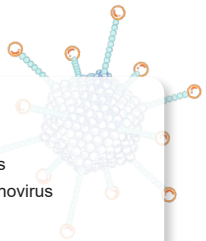


Lentivirus

- Lentivirus
- 3rd gen VSV-G pseudotyped LV
- 2nd gen VSV-G pseudotyped LV
- Integrase-deficient lentivirus (IDLV)
- Various envelope proteins for pseudotyping
- Virus-like particles (VLPs)

Adeno-Associated Virus

- ssAAV with 18+ serotypes
- scAAV with 18+ serotypes
- Baculovirus-AAV with 6+ serotypes
- AAV virus-like particles (VLPs)



Adenovirus

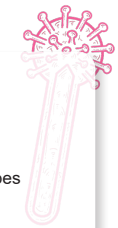
- Human Ad5 adenovirus
- Chimeric Ad5/F35 adenovirus
- Gutless adenovirus

MMLV Retrovirus

- VSV-G pseudotyped MMLV
- Self-inactivating MMLV
- Various envelope proteins for pseudotyping

MSCV Retrovirus

- VSV-G pseudotyped MSCV



Baculovirus

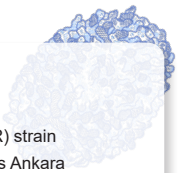
- Baculovirus strain AcMNPV
- Baculovirus-AAV with 6+ serotypes

Vesicular Stomatitis Virus

- VSV-G pseudotyped VSV
- Various envelope proteins for pseudotyping
- Bald VSV

Herpes Simplex Virus

- HSV genome modification on BAC (or BACYAC)
- HSV-1 packaging from BAC (or BACYAC)
- HSV amplicon vectors



Vaccinia Virus

- Western Reserve (WR) strain
- Modified Vaccinia virus Ankara (MVA) strain
- Vaccinia genome modification on BACYAC
- Vaccinia virus packaging

Lentivirus

Types of lentivirus offered

- VSV-G pseudotyped third-generation lentivirus (this is the default virus type)
- VSV-G pseudotyped second-generation lentivirus
- Lentivirus pseudotyped with other envelope proteins as requested, such as coronavirus spike (S) proteins
- Bald lentivirus lacking viral envelope protein
- Integrase-deficient lentivirus (IDLV)

Note: *We also offer lentivirus pseudotyping services with other envelope proteins.*

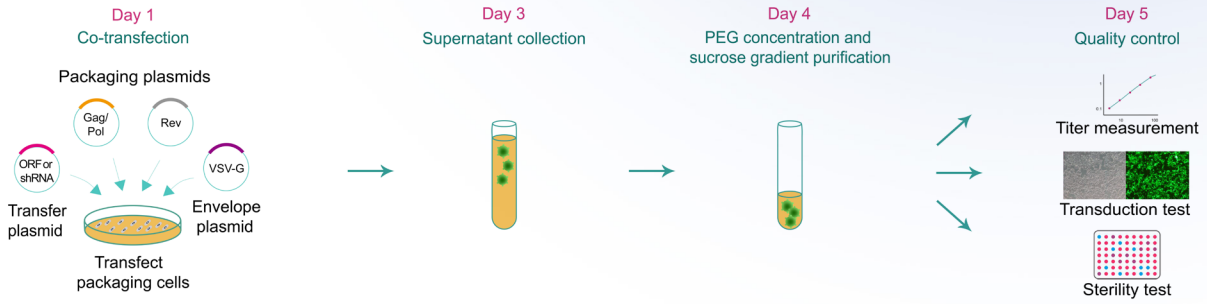


Figure 1. Typical workflow of lentivirus packaging.

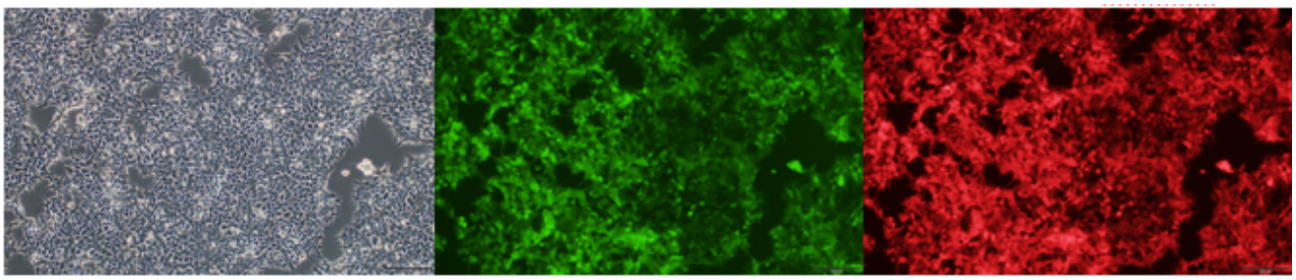


Figure 2. Lentivirus-mediated fluorescent protein expression in 293T cells. Magnification: 100X. Left: bright field. Middle: EGFP. Right: mCherry.

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Mini	Cell culture	>10^8 TU/ml	100 ul (4x25 ul)	$199	6-12 days
Pilot		>10^8 TU/ml	250 ul (10x25 ul)	$449	
Medium			1 ml (10x100 ul)	$649	
Large		>10^9 TU/ml	1 ml (10x100 ul)	$1,099	
Ultra-purified medium	Cell culture & in vivo	>10^9 TU/ml	500 ul (10x50 ul)	$1,399	
Ultra-purified large			1 ml (10x100 ul)	$1,699	

Note:

The above table applies to VSV-G pseudotyped 2nd- and 3rd-generation lentivirus (integrase-deficient lentivirus (IDLV) included).

Adeno-Associated Virus (AAV)

Types of AAV offered

- Single-stranded AAV (ssAAV) and self-complementary AAV (scAAV)
- 18 serotypes: 1, 2, 3, 4, 5, 6, 6.2, 7, 8, 9, rh10, DJ, DJ/8, PHP.eB, PHP.S, AAV2-retro, AAV2-QuadYF and AAV2.7m8
- AAV empty capsids or virus-like particles (VLPs) - custom and off-the-shelf products available
- AAV serotype testing panel- offers you the flexibility to customize your AAV panel with 3 or more AAVs from our collection of 18 serotypes

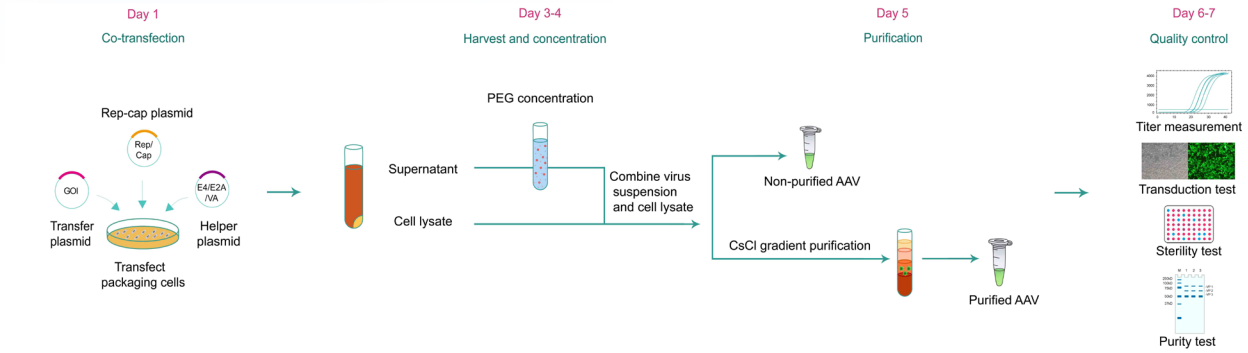


Figure 1. Typical workflow of triple transfection-based AAV packaging.

Tissue type	Recommended serotypes	Tissue type	Recommended serotypes
Smooth muscle	AAV1, 2, 3, 5, 6, 7, 8, 9, rh10	**Heart**	AAV1, 4, 5, 6, 8, 9, rh10, DJ
CNS	AAV1, 2, 4, 5, 7, 8, 9, rh10, PHP.eB	**Kidney**	AAV2, 4, 8, 9, rh10, DJ, DJ/8
PNS	AAV-PHP.S	**Lung**	AAV1, 3, 4, 5, 6, 6.2, 9, rh10
Brain	AAV1, 2, 5, 7, 8, DJ/8	**Testes**	AAV2, 9
Retina	AAV1, 2, 4, 5, 7, 8, 9, rh10, 2.7m8, 2-QuadYF	**Adipose**	AAV6, 8, 9
Inner ear	AAV1, 2, 6.2, 8, 9, 2.7m8	**Spinal nerves**	AAV2- retro
Spleen	AAV-DJ, DJ/8	**Endothelial cells**	AAV2-QuadYF
Liver	AAV1, 2, 3, 6, 6.2, 7, 8, 9, rh10, DJ, DJ/8	**Skeletal muscle**	AAV1, 9
Pancreas	AAV1, 2, 6, 8, 9, rh10		

Table 1. Reccomended AAV serotypes for different tissues.

Research grade AAV packaging

Our research grade AAV packaging services meet the vast majority of AAV-based gene delivery needs in basic research. Both triple transfection and baculovirus-based packaging methods can be selected based on your needs.

Triple transfection-based AAV price and turnaround

Scale	Application	Typical titer	Minimum titer	Volume	Price	Turnaround
Pilot	Non-purified, suitable for most cell culture experiments	>10^{12} GC/ml	>$2x10^{11}$ GC/ml	250 ul (10x25 ul)	$449	6-12 days
Medium				1 ml (10x100 ul)	$649	
Large		>$5x10^{12}$ GC/ml	>$2x10^{12}$ GC/ml	1 ml (10x100 ul)	$1,099	
Ultra-purified pilot	Cell culture & in vivo	>$2x10^{13}$ GC/ml	>10^{13} GC/ml	100 ul (4x25 ul)	$1,399	7-14 days
Ultra-purified medium				500 ul (10x50 ul)	$1,999	
Ultra-purified large				1 ml (10x100 ul)	$3,099	
Ultra-purified large 5				5 ml (10x500 ul)	From $9,899	14-21 days
Ultra-purified large 10				10 ml (10x1 ml)	From $15,899	21-28 days
Other scales				Please inquire		

Baculovirus-based AAV price and turnaround

Scale	Application	Minimum titer	Volume	Price	Turnaround
Ultra-purified pilot	Cell culture & in vivo	>$5x10^{13}$ GC/ml	1 ml (10x100 ul)	$5,599	35-49 days
Ultra-purified medium			5 ml (25x200 ul)	$20,199	35-49 days
Ultra-purified large			10 ml (50x200 ul)	$38,199	35-49 days

Research plus grade AAV packaging

Our research plus AAV packaging services are suitable for applications that are sensitive to impurities (e.g. host cell protein, endotoxin, etc.), or applications with special requirements on purification method, titer, or formulation. They are also optimal choices for your preclinical animal experiments.

Price and turnaround

Scale	Application	Total yield (GC)	Price	Turnaround
Research-plus 1	Various in vitro and in vivo experiments	$1x10^{13}$	From $4,699	10-20 days
Research-plus 5		$5x10^{13}$	From $14,899	21-28 days
Research-plus 10		$1x10^{14}$	From $23,899	
Other scales		Please inquire		

Note:

1. GC = Genome copies.

2. The above listed price and turnaround are based on purification by CsCl density gradient centrifugation. When other purification methods (e.g. iodixanol density gradient, affinity chromatography, ion-exchange chromatography, etc.) are required, please send us a design request to get the quote.

Comparison of different AAV grades

	Nonpurified research grade	Ultra-purified research grade	Research plus grade
Available purification method	-	CsCl density gradient	CsCl density gradient (default), iodixanol density gradient, affinity chromatography, ion-exchange chromatography
Titer	>10^{12} GC/ml	>10^{13} GC/ml	1x10^{13} - 5x10^{13} GC/ml
Achievable purity (assessed by SDS-PAGE)	-	>80%	>90%
Achievable endotoxin level	<30 EU/ml	<10 EU/ml	<2 EU/ml
Typical full capsid ratio	-	>70%	>80%

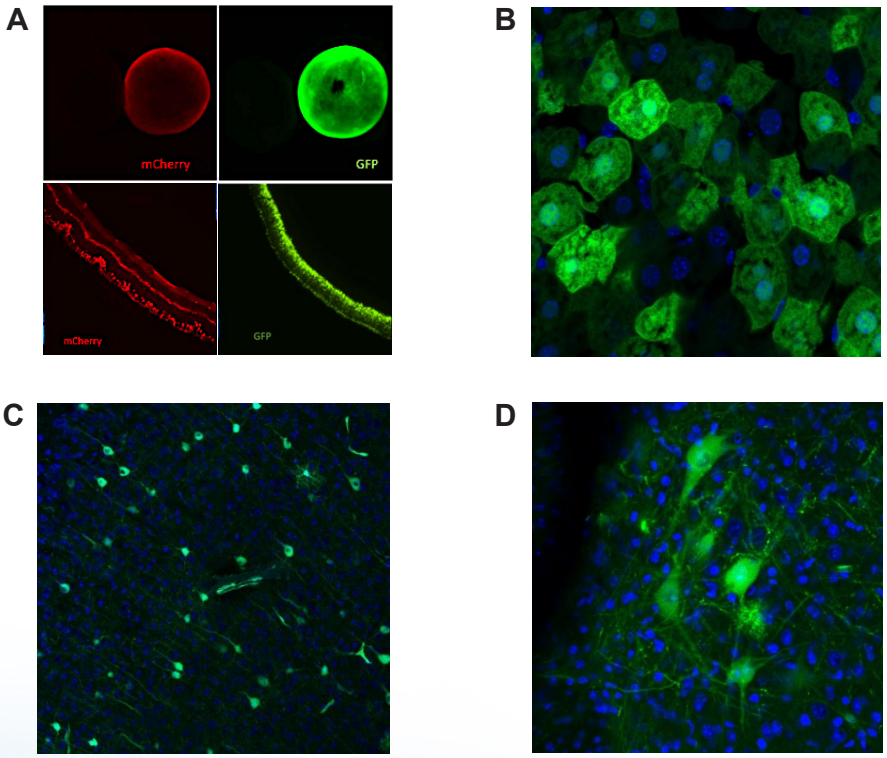


Figure 2. (A) AAV8-mediated mCherry and EGFP expression in mouse retina. (Hoang et al., unpublished data) (B) AAV9-mediated EGFP expression in (B) mouse hepatocytes, (C) mouse cortical neurons, and (D) mouse motor neurons. Magnification: 240X. Green: EGFP. Blue: DAPI.

Adenovirus

Types of adenovirus offered

- Human Ad5 adenovirus
- Chimeric Ad5/F35 adenovirus
- Gutless adenovirus

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Human Ad5 adenovirus					
Pilot	Cell culture	>10^{10} IFU/ml	250 ul (10x25 ul)	$649	28-35 days
Medium			1 ml (10x100 ul)	$1,099	
Large		>10^{11} IFU/ml	1 ml (10x100 ul)	$1,699	
Ultra-purified medium	Cell culture & in vivo	>10^{12} VP/ml	500 ul (10x50 ul)	$2,099	
Ultra-purified large			1 ml (10x100 ul)	$2,499	
Chimeric Ad5/F35 adenovirus					
Pilot	Cell culture	>10^{10} IFU/ml	250 ul (10x25 ul)	$1.099	35-42 days
Medium			1 ml (10x100 ul)	$1,699	
Large		>10^{11} IFU/ml	1 ml (10x100 ul)	$2,599	
Ultra-purified medium	Cell culture & in vivo	>10^{12} VP/ml	500 ul (10x50 ul)	$3,199	
Ultra-purified large			1 ml (10x100 ul)	$3,799	
Gutless adenovirus					
Ultra-purified medium	Cell culture & in vivo	>10^{11} VP/ml	500 ul (10x50 ul)	$3,999	44-62 days
Ultra-purified large	Cell culture & in vivo	>10^{11} VP/ml	1 ml (10x100 ul)	$4,999	

MMLV Retrovirus

Types of MMLV retrovirus offered

VSV-G pseudotyped wild-type and self-inactivating MMLV retrovirus.

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Pilot	Cell culture	>10^{7} TU/ml	250 ul (10x25 ul)	$449	6-12 days
Medium			1 ml (10x100 ul)	$649	
Large		>10^{8} TU/ml	1 ml (10x100 ul)	$1,099	
Ultra-purified large	Cell culture & in vivo	>10^{8} TU/ml	1 ml (10x100 ul)	$1,699	

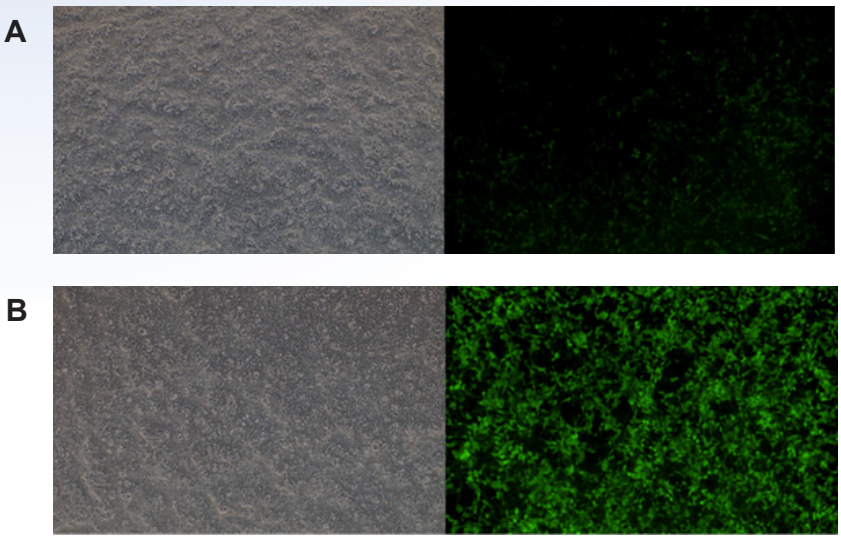


Figure 1. Comparison of two MMLV systems. (A) Wild-type MMLV vector pMMLV[Exp]-EGFP:T2A:Puro and (B) Self-inactivating MMLV vector pMMLV-SIN[Exp]-CMV>EGFP:T2A:Puro were packaged and transfected with an equal MOI. Magnification: 100X. Left: bright field. Right: EGFP.

MSCV Retrovirus

Types of MSCV retrovirus offered

VSV-G pseudotyped MSCV retrovirus

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Pilot	Cell culture	>10^7 TU/ml	250 ul (10x25 ul)	$449	6-12 days
Medium			1 ml (10x100 ul)	$649	
Large		>10^8 TU/ml	1 ml (10x100 ul)	$1,099	
Ultra-purified large	Cell culture & in vivo	>10^8 TU/ml	1 ml (10x100 ul)	$1,699	

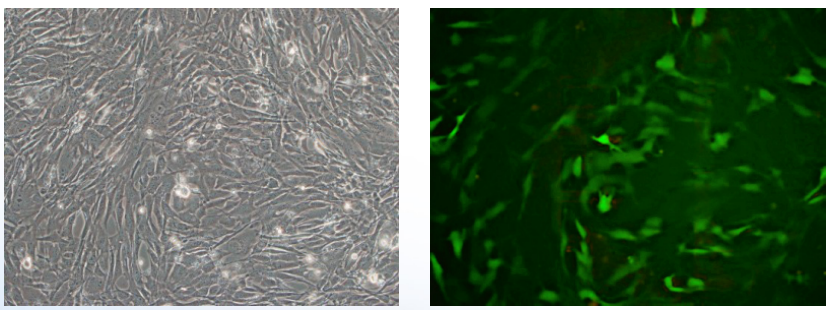


Figure 1. MSCV-mediated EGFP expression in mouse mesenchymal stem cells. Magnification: 100X. Left: bright field. Right: EGFP.

Baculovirus

Types of baculovirus offered

Baculovirus strain AcMNPV (Autographa californica multicapsid nucleopolyhedrovirus)

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Medium	Cell culture	>10^6 PFU/ml	1 ml (10x100 ul)	$649	15-22 days
Large		>10^7 PFU/ml		$1,099	22-29 days

Herpes Simplex Virus (HSV)

Types of HSV services offered

- HSV vector cloning in BAC or BACYAC backbone
- HSV-1 virus packaging
- HSV-1 amplicon vector cloning

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Ultra-purified pilot	Cell culture & in vivo	>10^7 PFU/ml	1 ml (10x100 ul)	$2,099	28-35 days
Ultra-purified medium		>10^8 PFU/ml		$3,099	

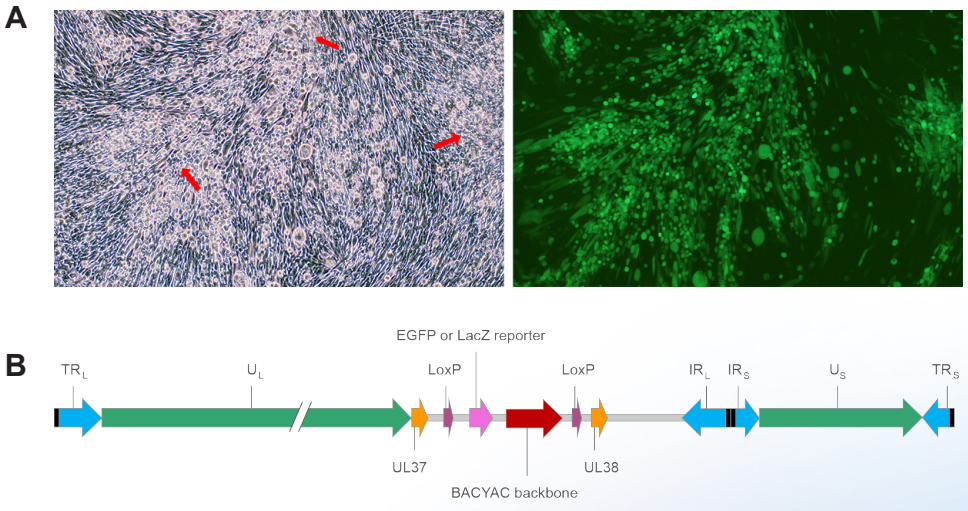


Figure 1. (A) BHK21 cells were transfected with our BACYAC vector carrying the full genome sequence of wildtype HSV-1 (KOS strain) along with an EGFP reporter. Images were taken at 48 hours post-transduction. Magnification: 100x. Left: bright field. Right: EGFP. (B) Map of HSV BACYAC backbone.

Vesicular Stomatitis Virus (VSV)

Types of VSV offered

- VSV pseudotyped with VSV-G protein
- VSV pseudotyped with coronavirus S protein and its variants
- VSV pseudotyped with any other envelope proteins as requested
- Bald VSV lacking viral envelope protein (can be used as negative control)

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
VSV pseudotyped with VSV-G					
Medium	Cell culture	>10^7 PFU/ml	1 ml (10x100 ul)	$1,099	21-35 days
Large		>10^8 PFU/ml		$1,399	
Ultra-purified medium	Cell culture & in vivo	>10^8 PFU/ml	500 ul (5x100 ul)	$1,699	
Ultra-purified large			1 ml (10x100 ul)	$2,699	
VSV pseudotyped with SARS-CoV-2 S protein and its variants (Luc or EGFP as transgene)					
Medium	Cell culture	>10^7 PFU/ml	1 ml (10x100 ul)	$2,199	21-35 days
Large		>10^8 PFU/ml		$2,799	
Ultra-purified medium	Cell culture & in vivo	>10^8 PFU/ml	500 ul (5x100 ul)	$3,399	
Ultra-purified large			1 ml (10x100 ul)	$5,399	
VSV pseudotyped with SARS-CoV-2 S protein and its variants (other transgenes)					
Medium	Cell culture	>10^7 PFU/ml	1 ml (10x100 ul)	$2,199	21-35 days
Large		>10^8 PFU/ml		$2,799	
Ultra-purified medium	Cell culture & in vivo	>10^8 PFU/ml	500 ul (5x100 ul)	$3,399	
Ultra-purified large			1 ml (10x100 ul)	$5,399	

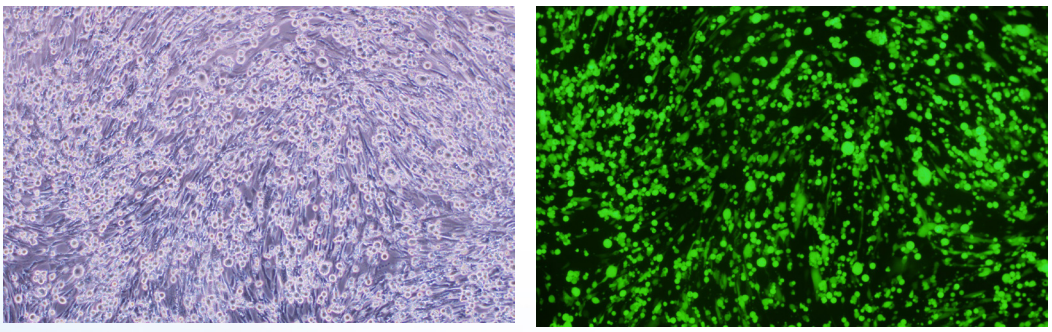


Figure 1. BHK-21 cells transduced with VSV pseudotyped with VSV-G protein. Magnification: 100X. Left: bright field. Right: EGFP.

Vaccinia Virus (VACV)

Types of VACV offered

- VACV vector cloning in VAC-BAC backbone for both attenuated Western Reserve (WR) and Modified Vaccinia virus Ankara (MVA) strains
- VACV virus packaging

Price and turnaround

Scale	Application	Titer	Volume	Price	Turnaround
Pilot	Cell culture	>10^8 PFU/ml	250 ul (10x25 ul)	$399	21-28 days
Medium	Cell culture	>10^8 PFU/ml	1 ml (10x100 ul)	$1,699	21-28 days
Ultra-purified medium	Cell culture & in vivo	>10^8 PFU/ml	1 ml (10x100 ul)	$2,699	21-35 days

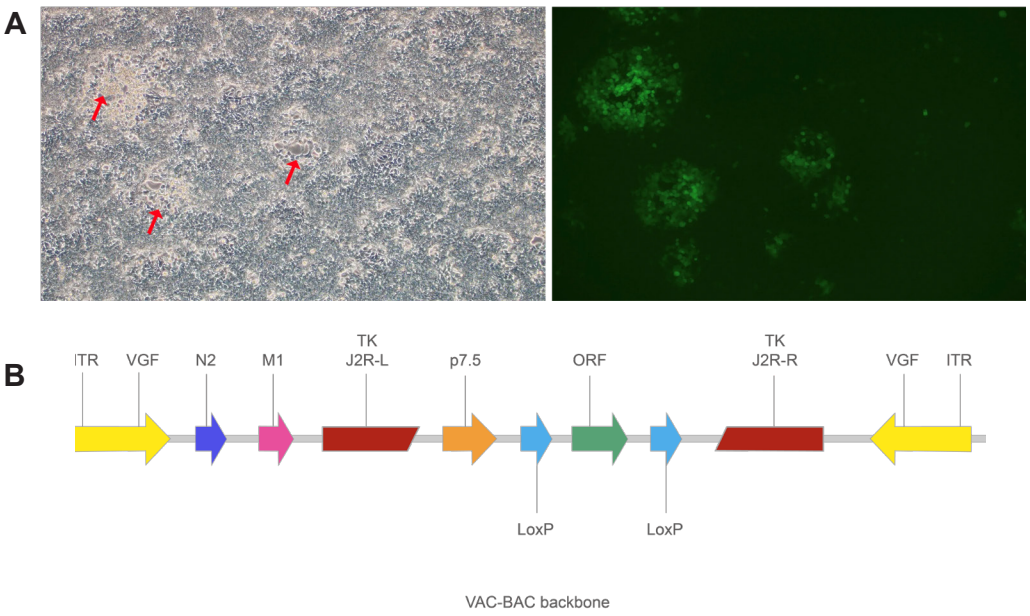


Figure 1. (A) 293T cells were transduced with VACV particles expressing EGFP (MOI: 2×10^{-3}). Images were taken at 96 hours post-transduction. Magnification: 200×. Arrows indicate signs of cytopathic effect (CPE). Left: bright field. Right: EGFP. (B) Map of recombinant VAC-BAC vector with ORF insert.

CRO Services

Therapeutic IVT RNA

VectorBuilder offers comprehensive CRO services for the development of RNA therapeutics including vaccines, gene replacement, chimeric antigen receptor (CAR), and gene editing. Our team of experts understand key considerations for therapeutic design and process development and can utilize their know-how to enhance the efficacy, safety, and manufacturability of RNA drugs.

For large-scale manufacturing of RNA therapeutics, check out our CDMO services on page 50.

Detailed information about our CDMO services and descriptions of our RNA synthesis services, including ordering information, are also available on the VectorBuilder website under ***Products & Services****.*

Figure 1. Workflow for IVT RNA therapeutic production.

IVT vector design and cloning

- Royalty-free IVT backbone with no IP constraints for commercial use
- Proprietary sequence optimization for optimal expression
- Variety of in-house validated 5' & 3' UTRs and polyA tails (including a 110 bp polyA tail) available
- Codon optimization support through literature-based, computational, and experimental approaches

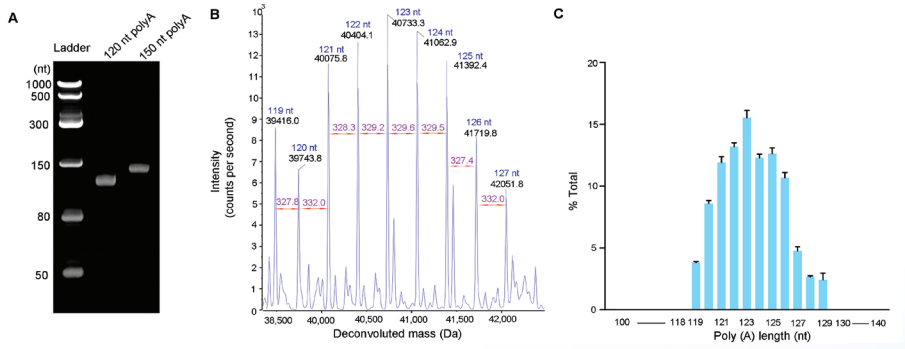


Figure 2. PolyA tail size analysis. (A) Isolated polyA tails analyzed by Urea-PAGE gel electrophoresis and (B) LC-MS, with an expected size of 120 nt. (C) Size distribution of polyA tails with an expected size of 120 nt.

IVT RNA production and & lipid nanoparticle (LNP) encapsulation

- As fast as 5 weeks from vector cloning to LNP encapsulation
- Synthesis of up to 10,000 nt mRNA and self-amplifying RNA from ug to g scales
- High capping efficiency (up to 99%) by co-transcriptional or enzymatic methods
- Proprietary purification process to efficiently remove impurities
- High-quality mRNA-LNP encapsulation at mg scale
- Various modified nucleotide options: m1Ψ, m5C, 5moU, etc.
- Comprehensive QC panel and LNP profiling
- Cell-free production of IVT template DNA for efficient large-scale IVT RNA manufacturing available

Functional validation

We can help you with functional studies to optimize your IVT RNA design for therapeutic purposes, including:

- Testing for various applications, such as antigen presentation, antibody expression, CAR expression, and CRISPR
- Assessing sequence optimization of various vector components (UTR, coding sequence, polyA, Kozak, etc.) in vitro and in vivo
- Assessing efficacy and safety using animal models including rodents and non-human primates

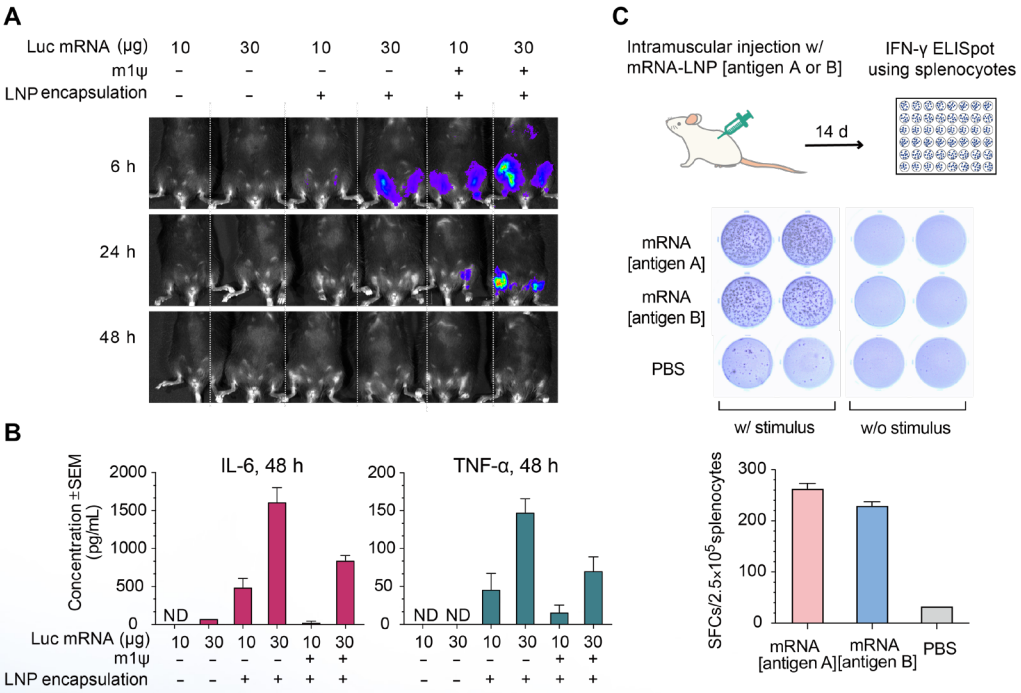


Figure 3. Expression of luciferase (Luc) mRNA and induced immune response in mice. (A) Luciferase activity visualized by live imaging post intramuscular injection. (B) Pro-inflammatory cytokines quantified in the serum. (C) IFN-γ ELISpot assay of splenocytes following injection of LNP-encapsulated mRNA coding for viral antigen A, viral antigen B, or PBS.

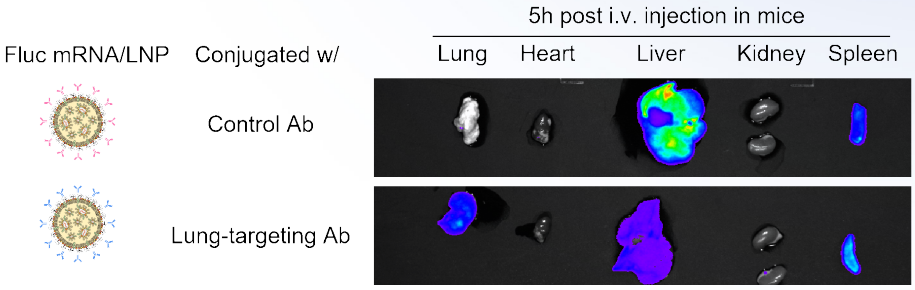


Figure 3. Anti-CD31 conjugated firefly luciferase (FLuc) LNP-mRNA showed improved luciferase expression in lung following injection into tail vein.

Library Screening

Libraries Offered

CRISPR Library

- Various CRISPR technologies
- >98% coverage of designed gRNAs

shRNA Library

- Wide range of complexity
- >98% coverage of designed shRNAs

Barcode Library

- >10^8 diversity
- High uniformity and unbiased nucleotide distribution

Enhancer/ Promoter Library

- High signal-to-noise ratio
- Incorporation of barcode and reporter

Mutation Library

- >10^8 complexity
- Diverse approaches

AAV Capsid Library

- High complexity
- In vivo screening including NHP

VectorBuilder is your full-service platform for library construction and screening services, streamlining your research from start to finish. Our team of experts is dedicated to assisting you in experimental design, creating high-quality libraries, and performing screening services that are tailored to your specific research goals.

Detailed descriptions of our pooled library services, including ordering information, are available on the VectorBuilder website under ***Products & Services****.*

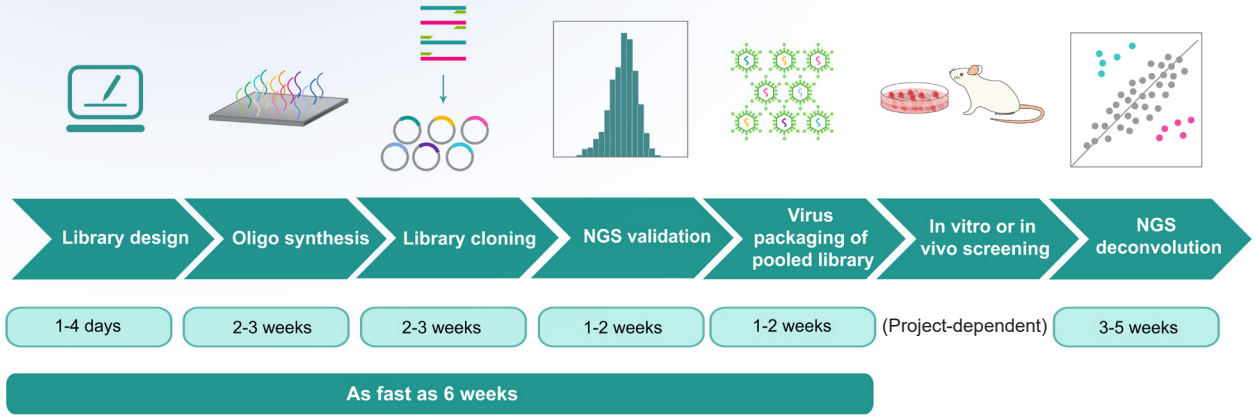


Figure 1. Workflow for library construction and screening.

Price and turnaround

Service	Brief description	Price	Turnaround
Library design	Library vector backbone design for CRISPR, RNAi, barcode, enhancer/promoter, mutation, AAV capsid, and more pooled libraries, and gRNA or shRNA sequence design for your target genes/regions.	Free	1-4 days
Pooled library cloning (including oligo synthesis and NGS validation)	Massive parallel cloning of DNA variants into desired vector backbone, followed by preliminary QC by Sanger sequencing and full QC by NGS. The default deliverable is E. coli glycerol stock.	From $2,300	5-8 weeks
Virus packaging of pooled library	Please see “Virus Packaging” on page 19. The price for packaging library is 1.5-fold of the price for packaging single vector.		
Pooled screening of library samples	in vitro or in vivo screening of your libraries. Includes cell viability screening, drug resistance screening, pathway screening, reporter screens, phenotypic screening, target-based screening, toxicity screening, and custom screenings.	Please inquire	
NGS deconvolution of post-screening sample	Includes NGS library preparation from genomic DNA of screened cells, Illumina sequencing (>500x coverage), and data analysis.	From $320 per sample	3-5 weeks

Stable Cell Line Engineering

VectorBuilder offers cell line engineering services ensuring fast and efficient production of cells with precise genome targeting, from design to thorough QC assays. Your cells can be delivered in as little as 6 weeks starting at $2,999. All cells are guaranteed to have desired genotypes, be contaminant-free, and authenticated according to ATCC standards.

Detailed descriptions of our stable cell line generation services, including ordering information, are available on the VectorBuilder website under ***Products & Services.***

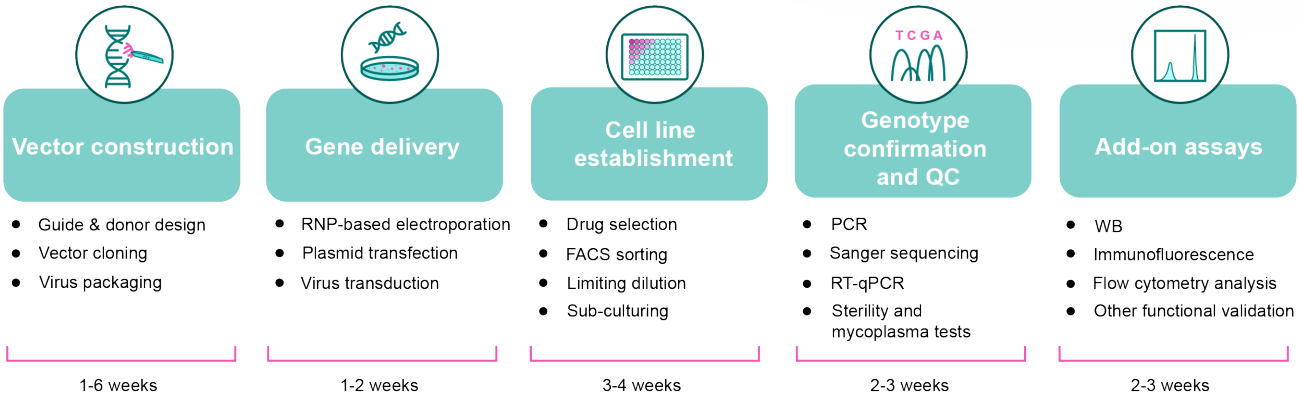
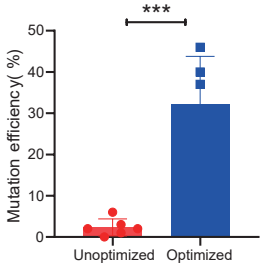


Figure 1. Workflow for Stable Cell Line Engineering.

CRISPR Gene Editing

Point mutation

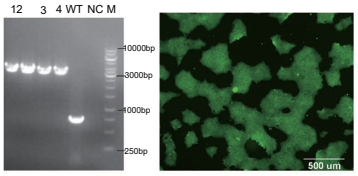
- HDR efficiency up to 50%
- Effective and safe non-viral delivery
- Homozygous clones delivered in **12-18 weeks from $7,999**



Increased HDR efficiency is achieved through optimized donor design and delivery approach.

Gene knockin

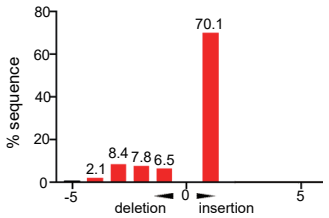
- 30-50% HDR rate for most cells
- Efficient knockin of large fragment
- Heterozygous clones delivered in **14-20 weeks from $7,999**



Knockin of 2.4 kb GFP expression cassette into iPSCs.

Gene knockout

- Expert gene targeting design
- Homozygous clones delivered in **6-12 weeks from $3,999**

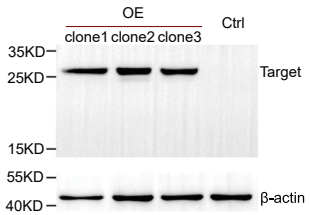


Efficient mutations generated around CRISPR target site in Huh-7 cells.

Gene Overexpression and Knockdown

Overexpression

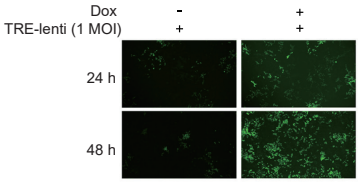
- Robust and stable expression of GOI via lentiviral transduction
- Mixed pool or single clones delivered in as fast as **8 weeks from $2,999**



Western Blot exhibits protein expression of GOI in Caco-2 cells

Tet inducible gene expression

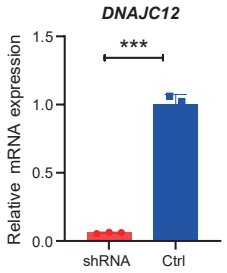
- Minimized leaky expression and high induction achieved by optimized vector design
- Mixed pool or single clones delivered in as fast as **8 weeks from $3,999**



Doxycycline-induced EGFP expression in tTS/rtTA-expressing 293T cells.

Gene knockdown

- Knockdown achieved by 3 different shRNAs and cells with most efficient knockdown delivered
- Mixed pool or single clones delivered in as fast as **8 weeks from $3,999**



90.9% knockdown efficiency for the GOI in Hep-G2 cells.

Price and turnaround

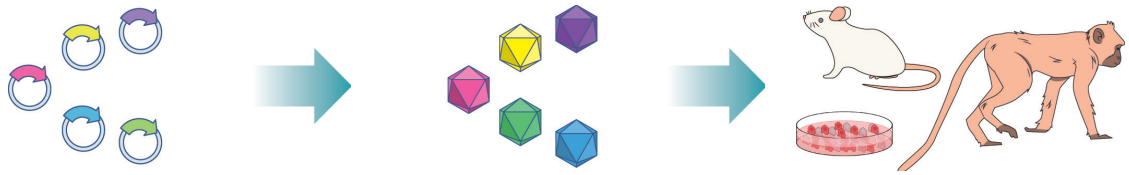
Service type	Deliverable	Price	Turnaround
Gene knockin (<3 kb)	One heterozygous single clone (>10^6 cells/vial, 2 vials)	From $7,999	14-20 weeks
Gene knockin (>3 kb)	One heterozygous single clone (>10^6 cells/vial, 2 vials)	From $10,999	16-24 weeks
Gene knockin	One homozygous single clone (>10^6 cells/vial, 2 vials)	Please inquire	
Gene knockout (frameshift mutation)	Two homozygous single clones (>10^6 cells/vial, 2 vials per clone)	From $3,999	6-12 weeks
Gene knockout (deletion mutation)	One homozygous single clone (>10^6 cells/vial, 2 vials)	From $5,999	6-12 weeks
Point mutation	One homozygous single clone (>10^6 cells/vial, 2 vials)	From $7,999	12-18 weeks
Gene overexpression	Mixed pool (>10^6 cells/vial, 2 vials)	From $2,999	8-11 weeks
	Two single clones (>10^6 cells/vial, 2 vials per clone)	From $3,999	13-16 weeks
Gene knockdown	Mixed pool (>10^6 cells/vial, 2 vials)	From $3,999	8-11 weeks
	Two single clones (>10^6 cells/vial, 2 vials per clone)	From $4,499	13-16 weeks
Tet-inducible gene expression	Mixed pool (>10^6 cells/vial, 2 vials)	From $3,999	8-11 weeks
	Two single clones (>10^6 cells/vial, 2 vials per clone)	From $4,499	13-16 weeks

AAV Capsid Evolution

Recombinant adeno-associated virus (AAV) is a highly popular gene delivery vector for a wide range of gene therapy and vaccine applications, thanks to its broad tropism, prolonged transgene expression, non-pathogenicity, and low immunogenicity.

Although many AAV serotypes exist, they may not be optimal in terms of tissue targeting capabilities, gene delivery efficiency, specificity, ability to evade host neutralizing antibodies and manufacturability.

To overcome these limitations, VectoBuilder offers an AAV capsid evolution service to generate novel AAV variants with improved features. Utilizing directed evolution, a process which mimics natural selection, wildtype AAV capsid genes are mutated to generate highly diverse AAV capsid libraries, which are then screened to identify novel capsid variants with improved properties.



Capsid library construction via various strategies

High-titer packaging of viral capsid library

Capsid screening and characterization in vitro and in vivo

Figure 1. Our capabilities for developing novel AAVs by directed evolution of AAV capsids.

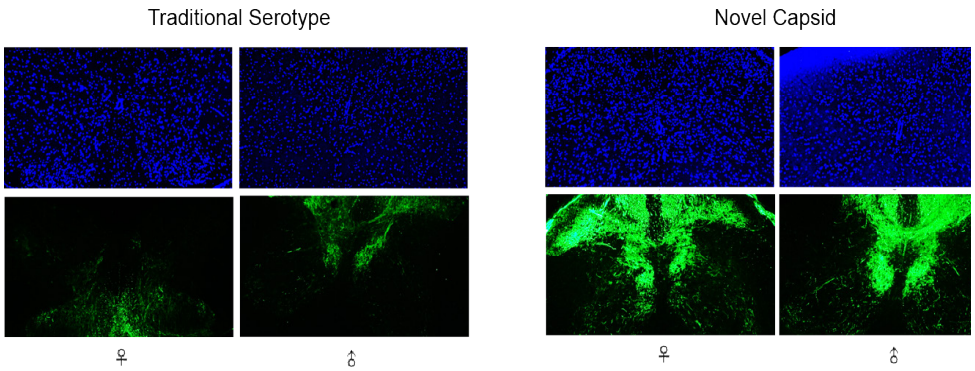


Figure 2. Optimization of vector delivery shells through AAV capsid evolution. Comparison of transgene delivery (CMV>EGFP) to mouse cervical spine from a traditional AAV serotype and a novel AAV serotype.

Highlights

- Full-service platform to fulfill all your needs along the workflow of generating highly diverse AAV capsid libraries
- High-complexity capsid library construction via any mutagenesis or combinatorial approach, including error-prone PCR, random peptide display, DNA family shuffling, and in silico design
- High-titer packaging of viral capsid library by either one-step or two-step approach
- In vivo screening in multiple species, including mice, rats, and NHPs
- Full technical support covering every aspect of your AAV capsid project from library design and construction to in vivo screening and NGS analysis

Detailed descriptions of our AAV capsid evolution services are available on the VectorBuilder website under ***Products & Services****.*

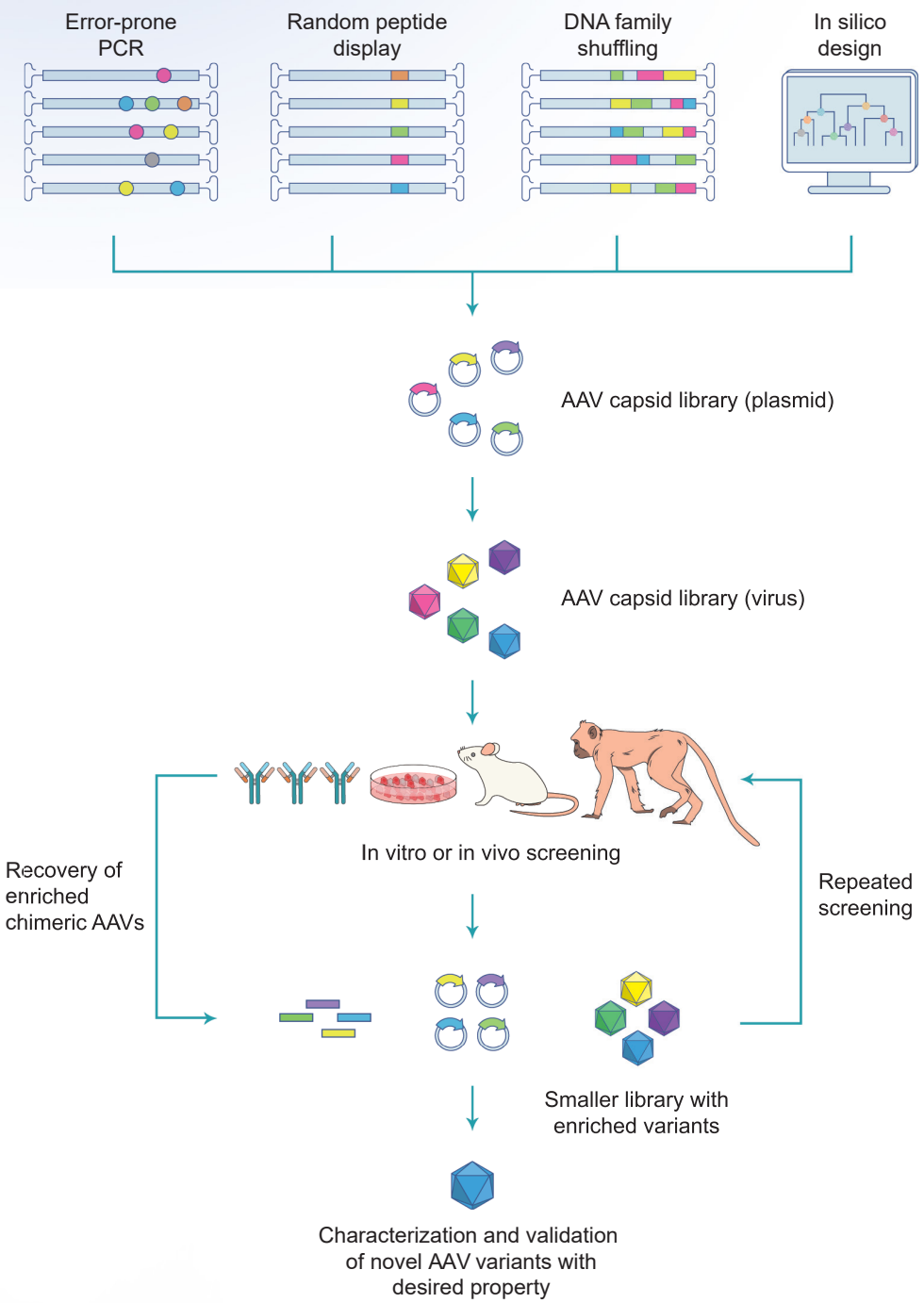


Figure 2. Typical workflow for screening novel AAV capsids by directed evolution. Generation of a highly diverse capsid library with plasmids carrying a rep gene and a capsid gene variant generated using various approaches, including error-prone PCR, random peptide display, DNA family shuffling, or in silico design. The capsid library is then packaged into viral particles and undergoes multiple rounds of screening to enrich for high-confidence hits. These are then validated and characterized to identify novel AAV capsid variants with enhanced properties.

AAV Biodistribution Profiling

Assessing the distribution and persistence of AAV vectors in various body tissues and organs at the developmental and preclinical stages is critical to ensure the success of AAV-based gene therapy. AAV biodistribution studies have been highly instrumental in identifying off-target effects, thereby playing a significant role in the safety assessment of AAV vectors.

VectorBuilder offers the most comprehensive AAV biodistribution studies in the industry to help you obtain high-resolution data in the most appropriate species, including NHPs.

Detailed descriptions of our AAV biodistribution profiling services are available on the VectorBuilder website under ***Products & Services.***

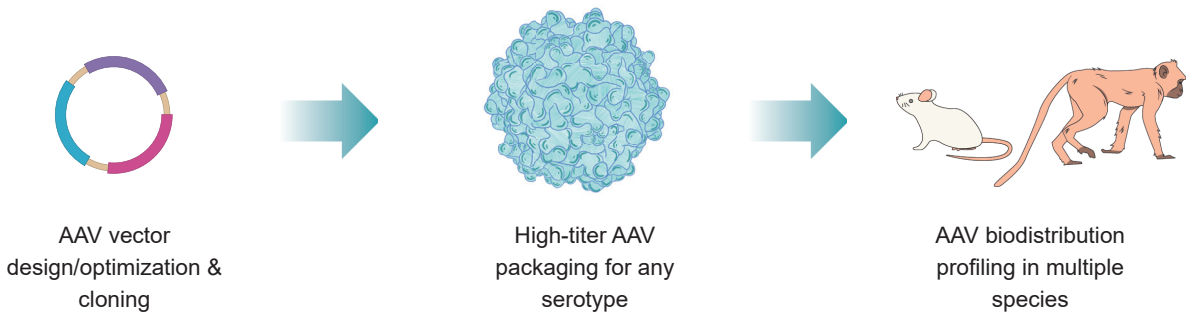


Figure 1. Our capabilities for performing biodistribution profiling studies of AAV vectors.

Highlights

- Full-service platform to fulfill all your needs along the workflow of biodistribution assessment for your AAV vectors
- Services available for multiple species, including mice, rats, and NHPs
- Multiple analytical assays, including fluorescence imaging, flow cytometry analysis, luciferase assay, qPCR, and RT-qPCR
- Multiplexing analysis using barcode and NGS for assessing the biodistribution of different vectors within the same animal
- Multiple routes of AAV administration by highly trained experts, including tail vein injection, facial vein injection (for neonatal mice and rats), intracerebroventricular injection, intrathecal injection, subretinal injection, intravitreal injection, intratympanic injection, and intramuscular injection
- Full technical support that covers every aspect of your AAV biodistribution project

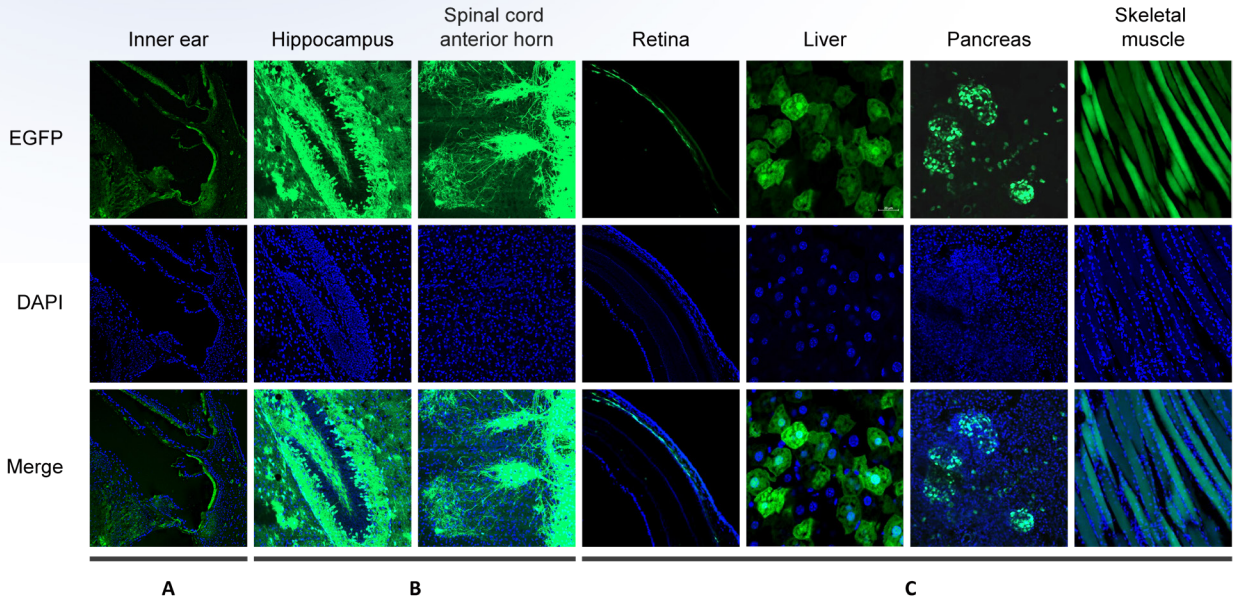


Figure 2. AAV9 biodistribution profiling. AAV9 carrying CAG promoter driving EGFP was administered to mice using various injection methods and analyzed in the following organs: (A) inner ear, (B) hippocampus and spinal cord anterior horn, (C) retina, liver, pancreas, and skeletal muscle.

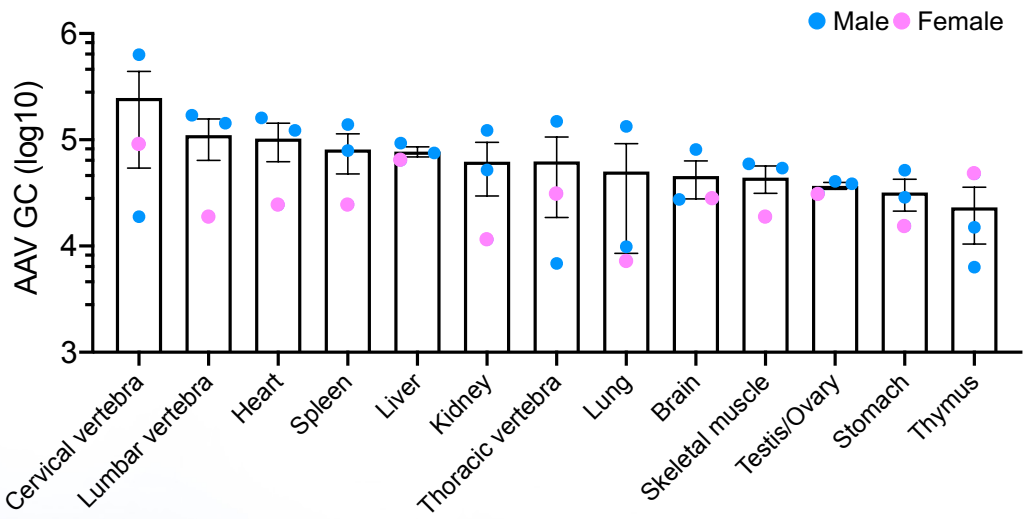


Figure 3. Recombinant AAV9 particles (~1.5X10^{10} GC/mouse) were intravenously administered to three neonatal mice within 48 h of birth. AAV9 biodistribution in several organs was quantified using qPCR six weeks after the injection.

Recombinant Protein Expression

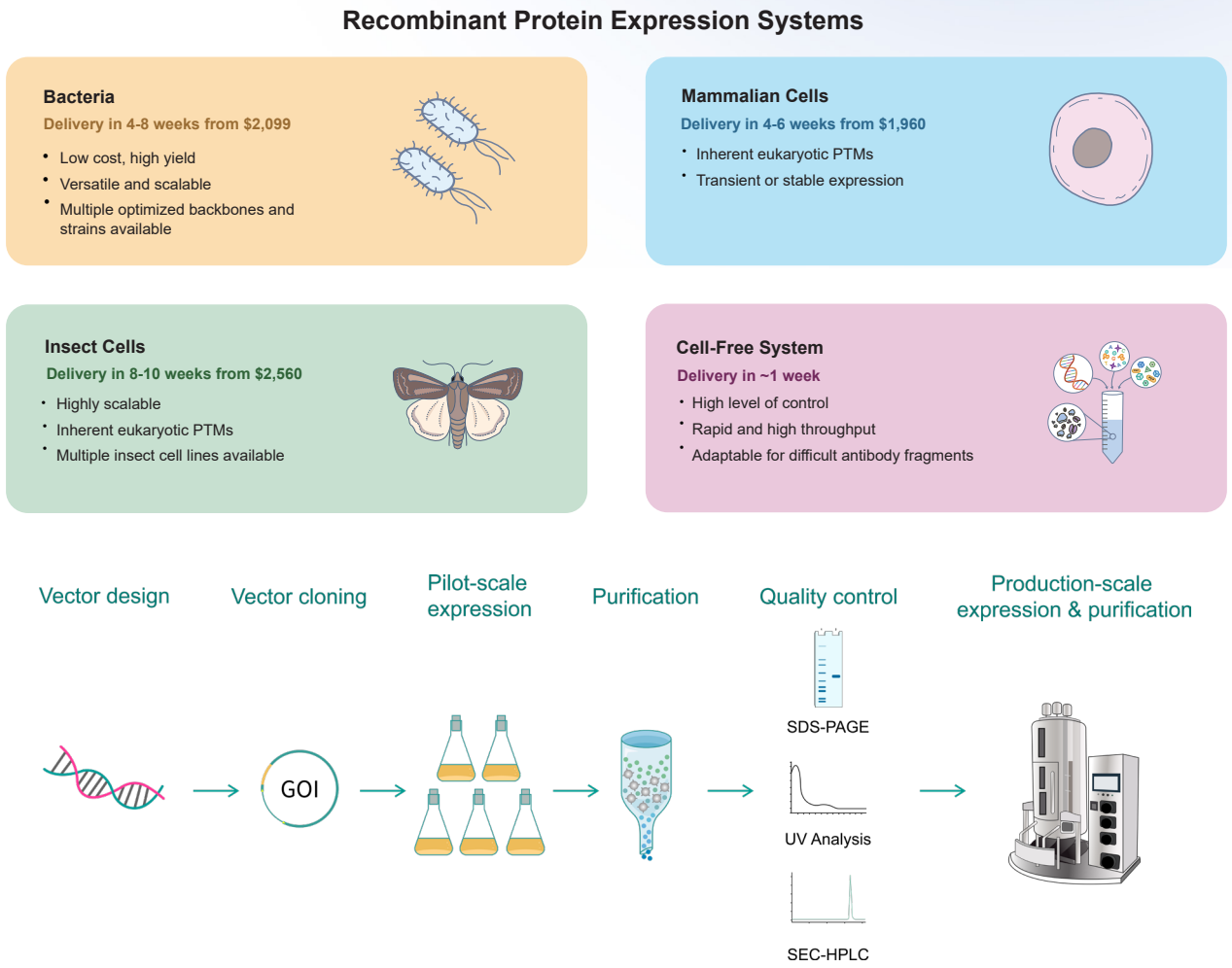


Figure 1. Workflow for recombinant protein production.

Default QC services	Method	Additional QC services	Method
Validation of protein expression vector	Restriction digestion analysis	Endotoxin test	LAL
	Sanger sequencing		
Protein concentration and purity measurement	A260/280 measurement	Protein characterization	Western Blot
			Intact MS (reduced)
			SEC-HPLC
	SDS-PAGE		SEC-MALs
			Protein N-terminal sequencing
			Host cell protein test
		Tag removal	Protease digestion
		Kinetics and affinity analysis	Octet
			Biacore

Table 1. Overview of QC methods available.

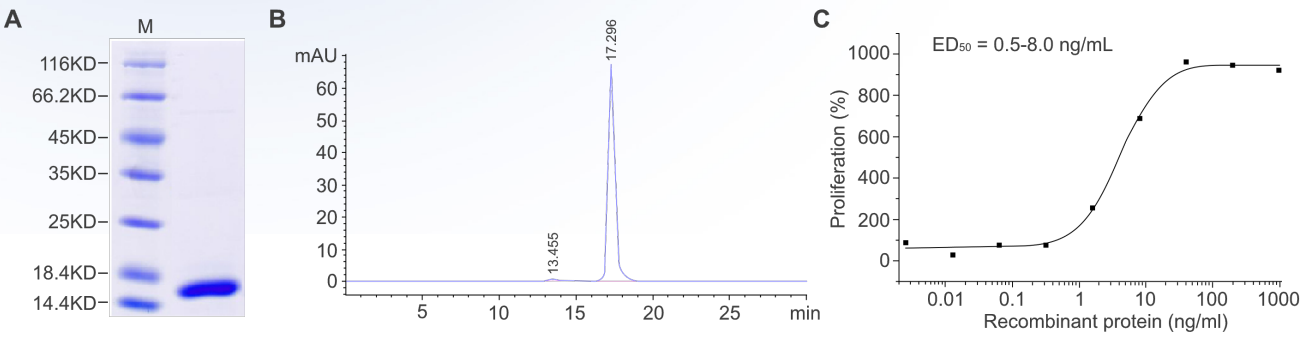


Figure 2. Characterization of a recombinant protein produced with E. coli. (A) SDS-PAGE analysis shows the molecular mass of the recombinant protein, with (B) ≥ 95% purity determined by SEC-HPLC. (C) The biological activity of the recombinant protein was measured by a cell proliferation assay.

Bacterial protein expression price and turnaround

Service module	Brief description	Deliverables	Price	Turnaround
Vector design and cloning	Vector design includes fusion partner selection, purification tag selection, and codon optimization. This is followed by gene synthesis and cloning into the bacterial recombinant protein expression vector, such as the pET.	E. coli glycerol stock	From $139	5-10 days
Expression evaluation and condition optimization	The expression vector is transformed into the appropriate host strain, such as BL21 (DE3). A small-batch evaluation will be conducted with various conditions, and the expression and solubility of the target protein will be assessed.	Expression evaluation report	From $600	1-2 weeks
Pilot-scale expression and purification	Based on the evaluation from the last step, 0.5-1 mg of purified target proteins can be produced if feasible, and quality control (QC) will be performed.	• 0.5-1 mg purified proteins (if feasible) • COA	From $1,200	2-4 weeks
Production-scale expression and purification	Scaled up production of >100 mg of purified proteins.	• Up to 100+ mg purified proteins • COA	Please inquire	

BAC Recombineering

Bacterial artificial chromosomes (BACs) are DNA vectors suitable for cloning and stably maintaining large DNA inserts of up to 300 Kb in E. coli. BACs can be genetically manipulated relatively easily and quickly to carry any desired modification using a homologous recombination-based genetic engineering technique known as BAC recombineering.

VectorBuilder offers a variety of BAC modification services, including placing reporters behind regulatory sequences on your BAC, introducing point mutations into genes of interest, transferring regions of the BAC onto a plasmid, and adding drug-selection or visualization markers to the BAC backbone. All you will need to do is send us a design request describing your experimental goal and we will take care of the rest for you starting from designing your BAC modification strategy and ordering your BAC to generating and validating your final modified BAC clones.

Detailed descriptions of our BAC recombineering services, including ordering information, are available on the VectorBuilder website under ***Products & Services****.*

User Testimonials

"Before using VectorBuilder, producing lentiviral overexpression vectors for our in vitro models was a recurring and time-consuming enterprise. We faced frequent challenges in every experimental step, which made it difficult to plan the actual experiments. Setting up the process with VectorBuilder was very efficient, thanks to their great expertise and support. Once we started using VectorBuilder's services, we noticed a substantial increase in productivity as well as a more uniform and predictable transduction pattern of our target cells.

We went on to use VectorBuilder for a large-scale CRISPR screen with a custom library spanning over 1,600 genes. With the provided virus, we were able to easily maintain cell representation and we derived a number of interesting hit genes, which we are excited to follow up on. A big thank you to the entire VectorBuilder Team!"

Dominic Schmid

University of Basel

GMP Manufacturing for Genetic Medicine

CDMO Services for GMP Manufacturing

VectorBuilder is a full-service CDMO with extensive expertise in manufacturing GMP-grade gene therapy vectors. We support the full spectrum of vector design, production, and QC needs along the entire gene therapy drug development pipeline. Our highly experienced team has worked with thousands of customers to create research-grade vectors for early discovery, GMP-like vectors for pre-clinical research, and full GMP-grade vectors for clinical applications.

Services Offered

Process development

VectorBuilder has a dedicated process development team with extensive experience in developing optimal manufacturing processes for GMP-grade gene therapy vectors. We consider many factors in our process development, including biological properties, quality and safety requirements, production quantity and scalability needs, regulatory requirements in the intended market, as well as the customer's cost and target timeline. Our process development services include **vector optimization as well as upstream and downstream process development**.

Analytical development

VectorBuilder provides the full range of analytical development services capable of developing, optimizing, qualifying and validating in-process, and release QC assays tailored to individual gene therapy vectors. We also provide drug stability studies to ascertain drug shelf life under various storage and transport conditions.

Plasmid DNA manufacturing

We can manufacture GMP-grade plasmid DNA at various scales, employing antibiotic-free, and animal component-free production methods.

GMP-like plasmid DNA is intended for pre-clinical studies such as animal testing of drug safety. Its production adopts key features of GMP guidelines, including comparable production processes and similar quality attributes. Its production is performed in segregated production suites with document control and traceability. Where appropriate, we produce GMP-like plasmids under antibiotic-free, animal component-free, and RNAase-free fermentation and purification conditions.

GMP-grade plasmid DNA is produced in our certified GMP suite with strict adherence to GMP guidelines.

We implement a comprehensive quality assurance system throughout the production process. We perform a wide range of in-process and releasing QC assays to ensure that plasmid DNA meets the desired quality and safety standard.

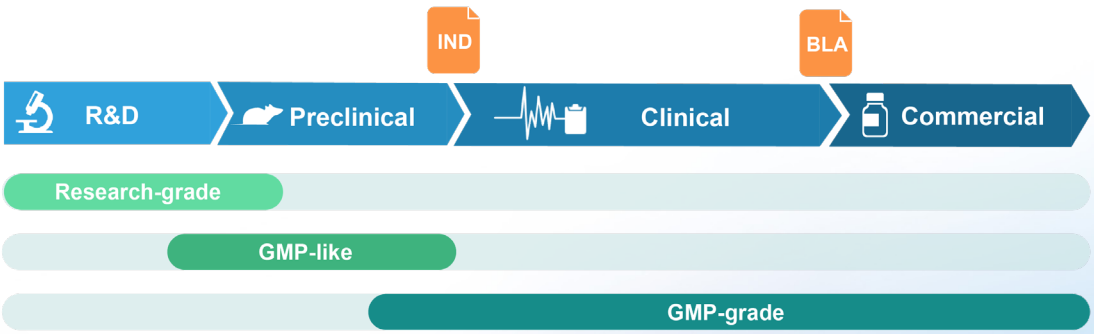


Figure 1. Grades of Plasmid DNA Offered.

Virus manufacturing

We provide viruses of different scales and quality attributes to meet the full range of demands throughout the gene therapy drug development pipeline. We have established and validated platform technology for large-scale GMP manufacturing of AAV and lentivirus. We also have experience producing other types of viral vectors, such as adenovirus, MMLV, HSV, and VSV.

- **AAV:** We package AAV in HEK293 cells under either adherent conditions (Cell Factory or fixed-bed bioreactors) or serum-free suspension conditions (up to 200 L single-use bioreactors). We also package AAV in suspension Sf9 insect cells. We can achieve a scale of up to 10^{17} GC AAV per batch.

- **Lentivirus:** We package lentivirus (2nd and 3rd generation, pseudotyped with VSV-G or other viral surface proteins) in HEK293, under either adherent growth conditions (Cell Factory or fixed-bed bioreactors) or serum-free suspension conditions (up to 200 L single-use bioreactors). We can achieve a scale of up to 10^{12} TU per batch.

Cell banking

We can generate GMP-grade Master Cell Banks (MCBs) and Working Cell Banks (WCBs) for E. coli, mammalian cells, and insect cells derived from either our in-house or customer-provided cell lines.

Fill/ finish

We can perform manual or automated aseptic filling of the DS/DP into glass vials (0.5 to 2 ml) or cryo bags. We have the capacity to complete 3,000+ vials per batch.

Regulatory support

We can work closely with our customers to provide regulatory support at each critical milestone of their drug development process. These include on-site audit, consultation for regulatory strategies, CMC, and BLA documentation support.

Technology transfer

We can provide technology transfer with best practices, including a detailed billl of materials, well-documented production processes, and fully qualified analytical methods used in the manufacturing of the gene therapy vector.

Quality Assurance

Our comprehensive quality system is embedded in every aspect of our GMP manufacturing process, which spans facilities, supplies, production, fill/finish, storage, in-process and release QC, and personnel. Our company culture emphasizes quality, innovation, continuous improvement, and “white-glove” customer service. As such, we consistently meet and exceed customer expectations. We also strive to achieve rapid turnaround and affordable prices while maintaining high quality and full regulatory compliance.

GMP Facilities

VectorBuilder currently has about 100,000 sq ft of modern GMP facilities with advanced designs and state-of-the-art equipment. All our facilities are designed to meet GMP regulations of US, EU, Japan, China and PIC/S. They are suitable for clinical trial Phase I/II/III manufacturing.

VectorBuilder grows together with the exploding demands on contracted manufacturing of gene therapies. Currently our stage 3 cGMP manufacturing campus (500,000 sq ft) with 30 production suites is under construction.

With all the areas combined, our facilities include:

- **10 GMP manufacturing suites:** Designed for plasmid, viral vector and cell line production at various scales, each with independent airflow; Grade A BSC in Grade B/C environment; BSL-2 certified
- **Fill/finish suites:** Grade A isolator in Grade C environment
- **QC laboratories:** Multiple lab suites totaling 9,500 sq ft for a wide range of QC assays
- **Process and analytical development suites:** Multiple GMP suites totaling 8,000 sq ft for PD/pilot runs; Grade A BSC in Grade C environment; BSL-2 certified

10 GMP manufacturing suites

Fill/finish suites

QC laboratories

Process and analytical development suites

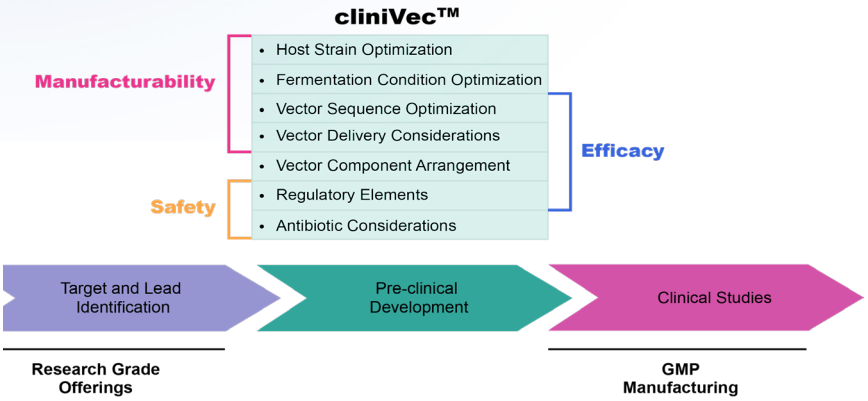
GMP warehouse

Upcoming expansion

Figure 2. Images of GMP Facilities.

cliniVec™

VectorBuilder's cliniVec™ program provides researchers with comprehensive solutions, facilitating the smooth transition from research and validation to pre-clinical studies. The dedicated cliniVec™ design team at VectorBuilder focuses on optimizing vector designs specifically for pre-clinical and clinical studies.



Vector design, crucial for safety and efficacy

Several key considerations are imperative in the design of a safe and efficacious pre-clinical vector, including the vector sequence, the antibiotic selection marker, incorporation of regulatory elements with viral origin, toxicity and immunogenicity of vector components.

Manufacturability

Additionally, optimization of yield through backbone design consideration, host strain optimization, and fermentation testing is essential for maximizing the quantity, quality and cost-effectiveness of vector production. We can provide support by ensuring the scalability of upstream and downstream processes, reproducibility of yield and quality, and regulatory compliance.

Experts in sequence screening

As experts in in vitro and in vivo screening services, VectorBuilder can provide tailored screening solutions, including promoter and coding sequence screening, in addition to screening vector delivery shells. We provide end-to-end screening services from library generation to NGS-sequencing and validation. Elevate the success of your vector development by partnering with the cliniVec™ design team for tailored screening solutions that meet the highest standards of precision and reliability.

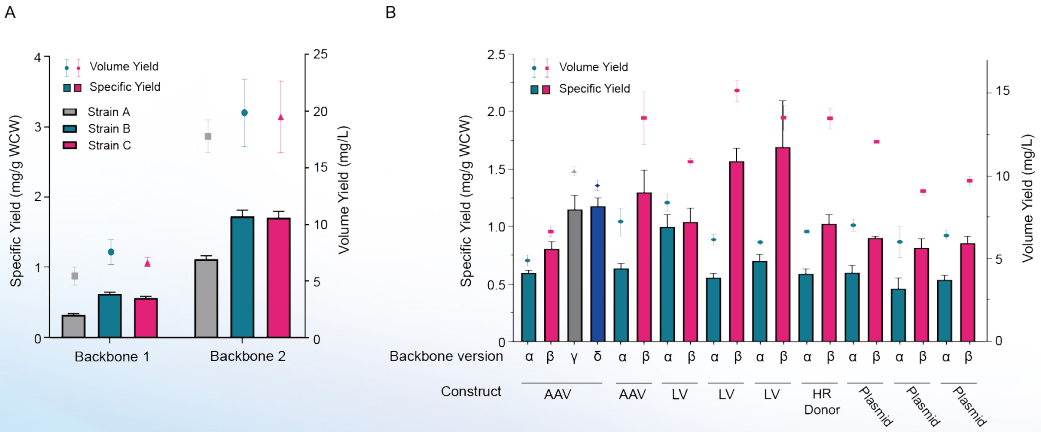
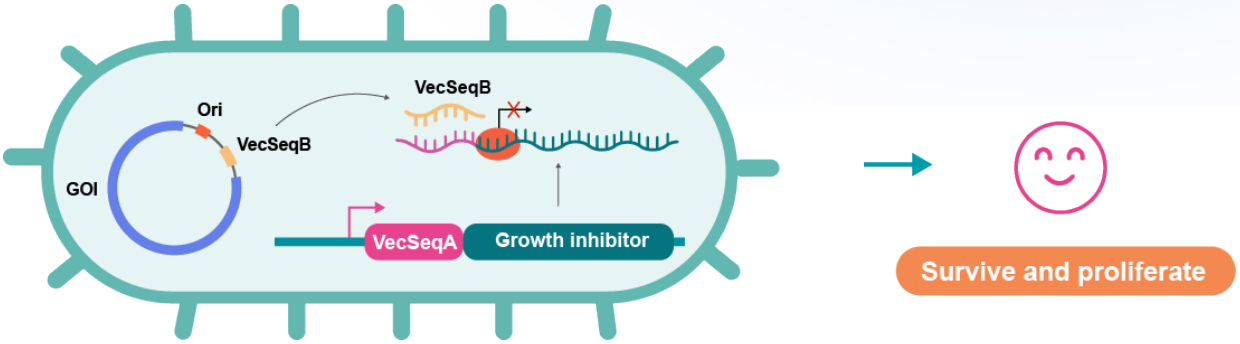


Figure 1. Yield optimization through backbone and host strain optimization. Vector constructs were cloned into different backbones and subjected to lab scale fermentation to test for specific (bar) and volumetric (dot) yields.

GMP Products - miniVec™ Miniaturized Plasmid

VectorBuilder's proprietary miniVec™ plasmid offers a miniaturized backbone, providing remarkable efficacy, safety, and manufacturability for cell and gene therapies. Compared to traditional plasmids, miniVec™ plasmids have higher plasmid manufacturing and virus packaging yields, improved transgene expression, and an enhanced safety profile.



Highlights

- Antibiotic-free and supplement-free fermentation
- Increased plasmid syields
- Enhanced transgene expression
- Efficient transposon delivery
- Safer source material for virus packaging

Expression Systems Supported

- Regular Plasmid
- Lentivirus
- AAV
- Sleeping Beauty
- PiggyBac

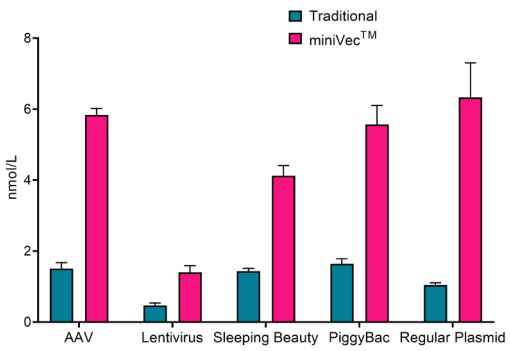


Figure 1. miniVec™ exhibits increased plasmid yields compared to traditional plasmids.

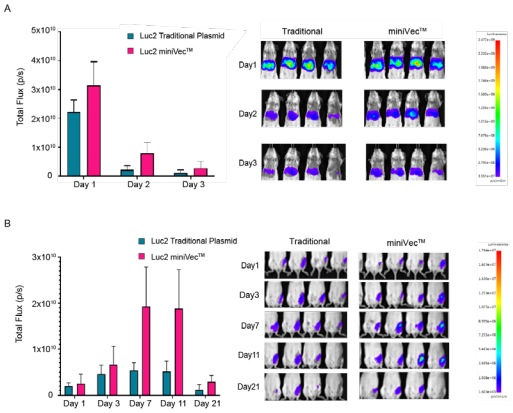


Figure 2. miniVec™ exhibits enhanced transgene expression compared to traditional plasmids.

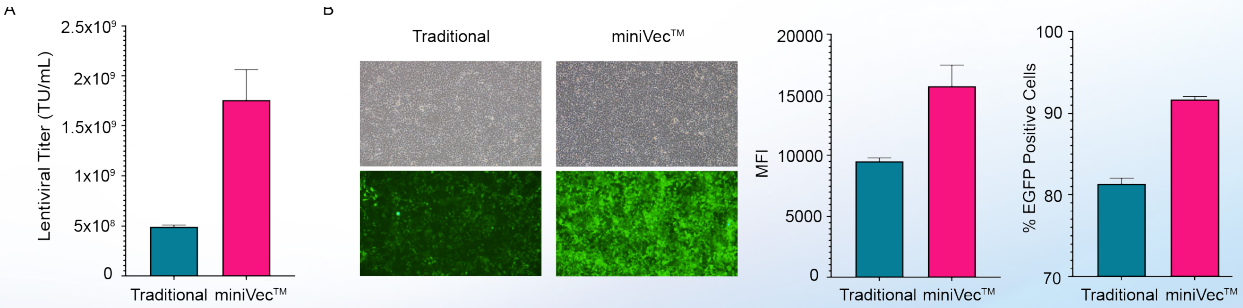


Figure 3. miniVec™ exhibits enhanced viral titers and is a safer source material for virus packaging compared to traditional plasmids.

GMP Products - Virus Packaging Plasmids

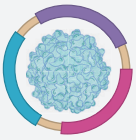
We provide off-the-shelf GMP-like and GMP packaging plasmids to facilitate manufacturing of pre-clinical and clinical viral vectors for gene therapies. We conduct extensive quality control to eunsure our GMP-like and GMP-grade plasmids are of the highest quality.

Plasmids offered

Lentivirus packaging plasmids

VB-VSV-G
VB-Rev
VB-Gag/Pol

AAV packaging plasmids



VB-AAV-Helper
VB-AAV2-Rep/Cap
VB-AAV9-Rep/Cap

Highlights

- Optimized and validated for high virus yield
- Off-the-shelf plasmids available for immediate use
- Plasmids produced under animal-free and antibiotic-free conditions
- Royalty free
- DMFs available simplifying FDA IND application Kan resistance

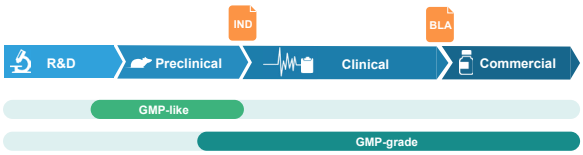


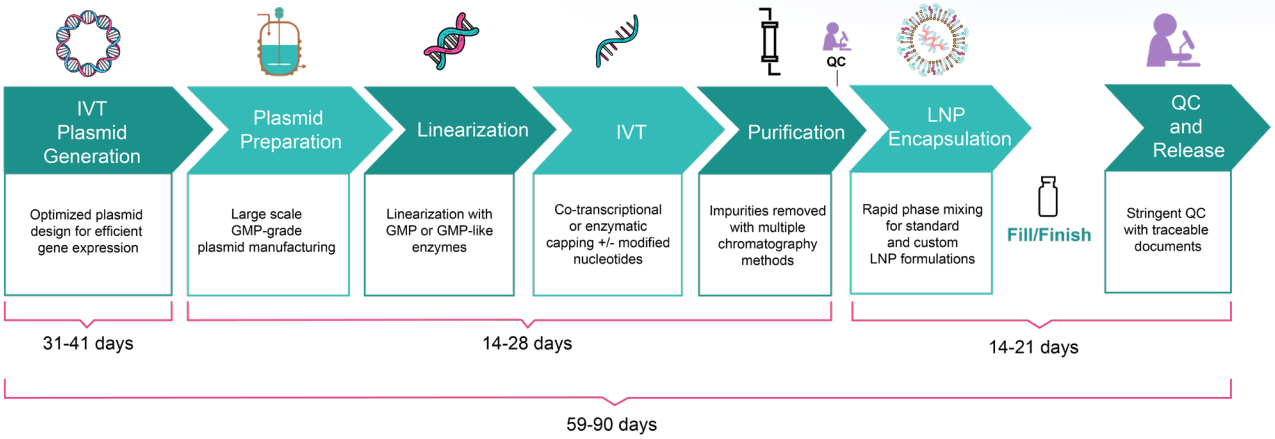
Figure 1. Grades of plasmid DNA offered.

QC	Method	GMP-like	GMP-grade
Plasmid concentration	UV spectrophotometry	≥500 ug/ml	≥500 ug/ml
Restriction digestion	Agarose gel electrophoresis	Identical to expected restriction pattern	Identical to expected restriction pattern
Sanger sequencing	Sanger sequencing of the entire plasmid	Identical to reference sequence	Identical to reference sequence
A260/A280	UV spectrophotometry	1.80-2.00	1.80-2.00
ccc plasmid DNA ratio	EtBr stained agarose gel electrophoresis	≥80%	≥80%
Residual protein	BCA or equivalent	≤2.00%	≤2.00%
Residual RNA	Fluorescence analysis or equivalent	≤5.00%	≤5.00%
Residual host cell DNA	Quantitative PCR or equivalent	Report result	≤5.00%
Endotoxin	Kinetic chromogenic assay	≤50 EU/ml	≤10 EU/ml
Sterility	Direct inoculation	No growth	No growth

Table 1. QC assays and specifications for GMP-like and GMP-grade plasmid.

GMP IVT RNA and LNP Manufacturing

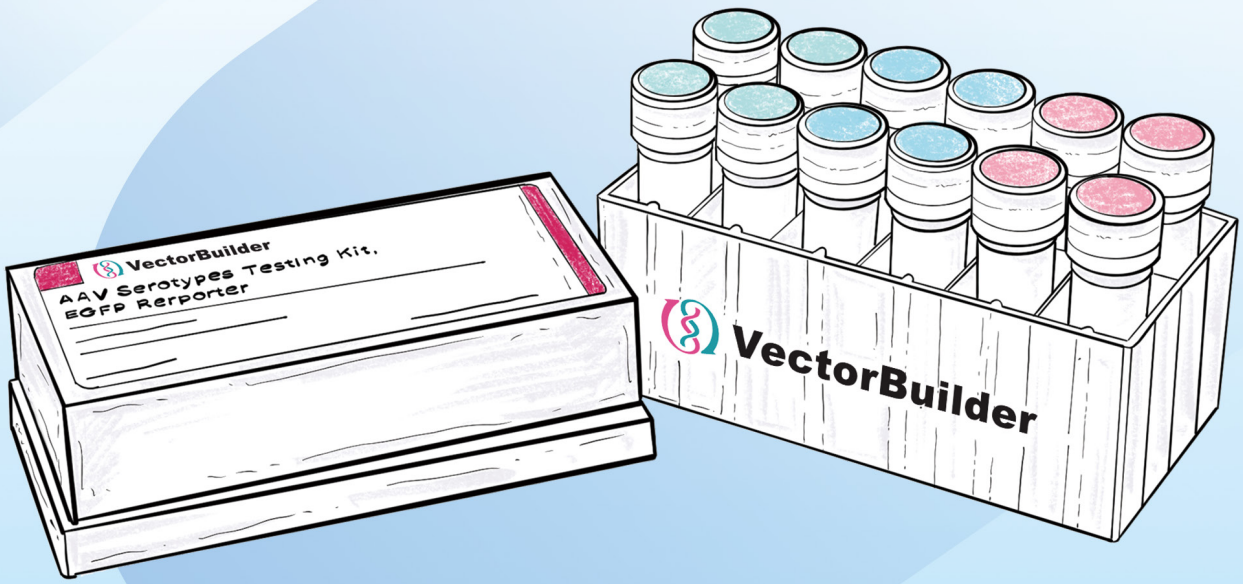
VectorBuilder offers a full range of CRO and CDMO services for in vitro transcription (IVT) mRNA manufacturing and lipid nanoparticle (LNP) therapeutic development. Relying on our revolutionary vector design platform and extensive experience, we can provide optimal in vitro transcription vector designs, large-scale IVT mRNA manufacturing, and LNP encapsulation followed by thorough quality control tailored to a wide range of research and clinical needs. We offer several grades that cover different downstream needs including drug discovery research and pre-clinical studies.



	Research-grade	GMP-like
Applications	Basic research, drug discovery, and preclinical studies	Preclinical studies such as animal testing of drug safety and metabolism
Production scales	mRNA: 0.1-10 mg LNP: 0.1-3 mg	mRNA: 0.01-20 g LNP: 3-20 mg
Turnaround time	49-71 days • Vector design & cloning: 26-36 days • Plasmid production & linearization: 14-21 days • IVT mRNA production: 14-21 days • LNP encapsulation: 9-14 days	59-90 days • Vector design & cloning: 31-41 days • Plasmid production & linearization: 14-28 days • IVT mRNA production: 14-28 days • LNP encapsulation: 14-21 days
Quality system	ISO9001	ISO9001 while adopting key features of GMP system
Production facility	In parallel production in shared laboratory space	Productions done in segregated suites
Document control and traceability	No	Yes
QC and release	Standard QC	Performed on a case-by-case basis depending on individual project needs
Aseptic fill/ finish	N/A	Available upon request
Storage of retention sample	Available upon request	Available upon request
Other deliverable	COA	1. COA 2. Manufacturing summary 3. TSE/BSE statement upon request

Table 1. Comparison of research and GMP-like mRNA-LNP manufacturing.

Off-the-Shelf Products



Premade Libraries

Premade CRISPR and shRNA Libraries starting at *$1,999*

VectorBuilder offers high-quality premade CRISPR and shRNA libraries that serve as powerful and cost-effective tools for knock-out, knock-down, or knock-up across various scales, from whole-genome to pathway-specific. These libraries are validated by NGS, exhibit high uniformity, and come in our well-established lentiviral vector that is packaged at a high titer and ready to use.

*Detailed descriptions of our pooled library construction services, including ordering information, are available on the VectorBuilder website under **Products & Services**.*

Libraries Offered

CRISPR

- Whole genome CRISPR knockout libraries
- Whole genome CRISPRa libraries
- Whole genome CRISPRi libraries
- Pathway-specific knockout libraries, including DNA damage response, transcription factor, and metabolic genes

shRNA

- Whole genome human and mouse
  >20,000 RefSeq genes
- Elite genes human and mouse
  ~2,000 most frequently cited genes on PubMed

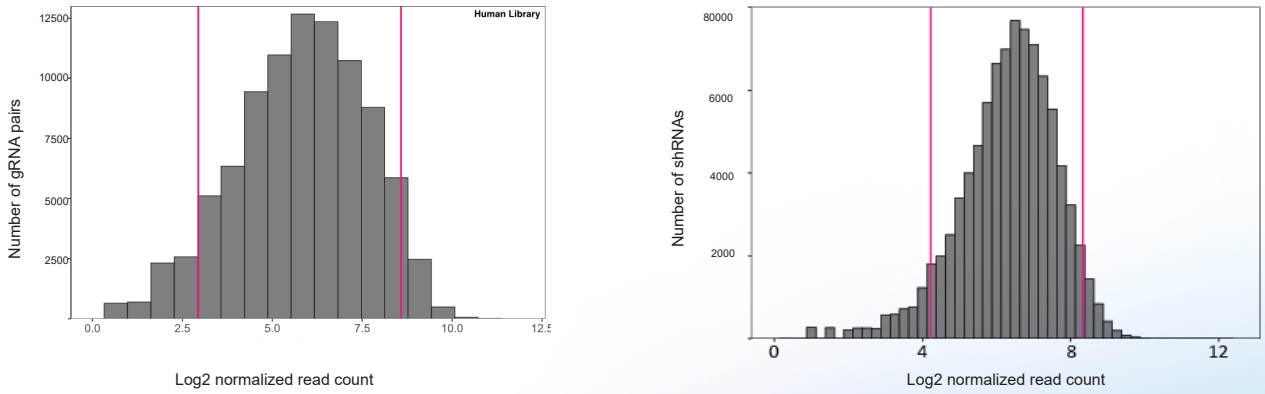


Figure 1. Representation of gRNAs (left) and shRNAs (right) in different pooled plasmid libraries.

Premade shRNA Libraries

VectorBuilder offers high-quality, pooled shRNA lentivirus libraries targeting human and mouse genes at two scales: Whole Genome (~19,000 RefSeq genes) and Elite Gene (~2,000 most frequently cited genes on PubMed Central).

These RNAi libraries are highly efficient tools for performing large-scale loss-of-function screens for genes involved in disease pathways, cell responses to drug treatment, developmental processes, gene regulation, etc.

Price and turnaround

Product	Target genes	No. of shRNAs	Scale	Price	Turnaround
Human Elite Gene Pooled shRNA Library	2,161	12,471	Medium (>1.0x10^8 TU/ml, 1 ml)	$1,999	7-14 days
Mouse Elite Gene Pooled shRNA Library	2,233	12,472	Medium (>1.0x10^8 TU/ml, 1 ml)	$1,999	
Human Whole Genome Pooled shRNA Library	20,593	105,233	Medium (>1.0x10^8 TU/ml, 1 ml)	$1,999	
			Plus (>1.0x10^8 TU/ml, 5 ml)	$2,499	
Mouse Whole Genome Pooled shRNA Library	22,023	105,170	Medium (>1.0x10^8 TU/ml, 1 ml)	$1,999	
			Plus (>1.0x10^8 TU/ml, 5 ml)	$2,499	

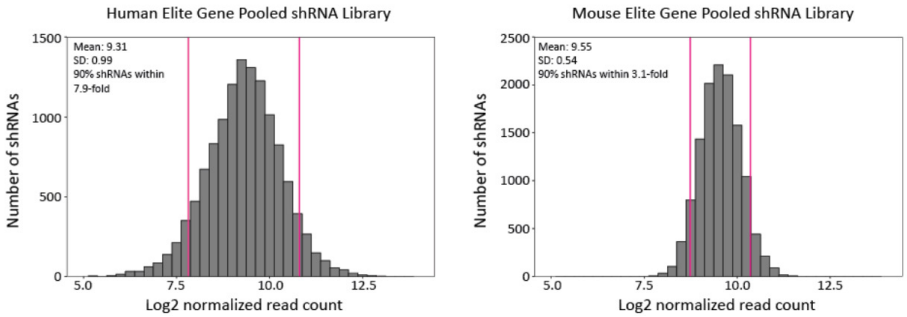


Figure 1. Representation of shRNAs in different pooled plasmid libraries.

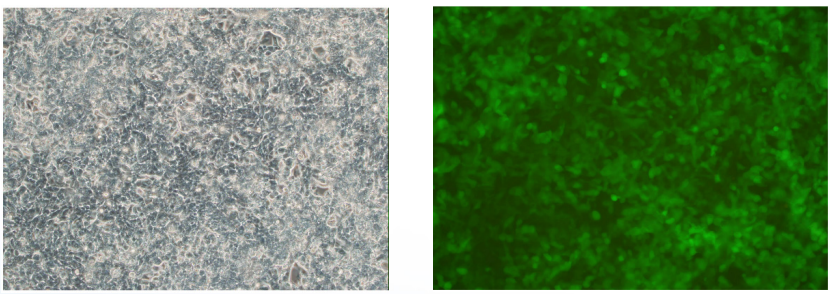


Figure 2. EGFP marker expression in 293T cells transduced with Elite Gene Pooled shRNA Library (MOI=10) after 4 days of puromycin selection (1.5 ug/ml). Magnification: 200X. Left: bright field. Right: EGFP.

Premade CRISPR Libraries

VectorBuilder offers the only commercially available dual-gRNA lentivirus libraries for CRISPR-based whole-genome knockout screens in human and mouse cells. Each CRISPR vector contains a pair of gRNAs targeting the same gene. Dual-gRNA libraries are more effective for knockout screens because the introduction of large deletions by these libraries can have much higher efficiencies in generating loss-of-function mutations. Additionally, VectorBuilder offers popular pathway knockout, knockdown, and knockup libraries.

Price and turnaround

Product name	No. of genes	No. of gRNAs	Scale	Price
Whole-genome CRISPR knockout libraries				
Human Whole-Genome Dual-gRNA Library	20,048	91,926 (pairs)	Medium	$2,999
			Plus	$3,499
Mouse Whole-Genome Dual-gRNA Library	20,493	90,344 (pairs)	Medium	$2,999
			Plus	$3,499
Human GeCKO V2 Library A	19,050	65,383	Medium	$1,999
			Plus	$2,499
Human GeCKO V2 Library B	19,050	58,028	Medium	$1,999
			Plus	$2,499
Human GeCKO V2 Library A + B	19,050	123,411	Medium	$2,999
			Plus	$3,499
Mouse GeCKO V2 Library A	20,611	67,405	Medium	$1,999
			Plus	$2,499
Mouse GeCKO V2 Library B	20,611	62,804	Medium	$1,999
			Plus	$2,499
Mouse GeCKO V2 Library A + B	20,611	130,209	Medium	$2,999
			Plus	$3,499
Human Whole-Genome CROP-seq KO Library	19,050	123,411	Medium	$4,099
			Plus	$4,599
Mouse Whole-Genome CROP-seq KO Library	20,611	130,209	Medium	$4,099
			Plus	$4,599
Human Whole-Genome Perturb-seq KO Library	19,050	123,411	Medium	$4,999
			Plus	$5,499
Mouse Whole-Genome Perturb-seq KO Library	20,611	130,209	Medium	$4,999
			Plus	$5,499

Product name	No. of genes	No. of gRNAs	Scale	Price
Whole-genome CRISPRa libraries				
Human CRISPRa (SAM) Library	23,430	70,290	Medium	$4,099
			Plus	$4,599
Mouse CRISPRa (SAM) Library	23,439	69,225	Medium	$4,099
			Plus	$4,599
Whole-genome CRISPRi libraries				
Human CRISPRi Library	23,430	70,290	Medium	$4,099
			Plus	$4,599
Mouse CRISPRi Library	23,439	69,225	Medium	$4,099
			Plus	$4,599
Pathway-specific CRISPR knockout libraries				
DNA Damage Response Genes MKOv4 Library	460	4,530	Medium	$2,399
Human Epigenetic Genes KO Library	2,508	20,051	Medium	$3,499
Human Ubiquitination-Related Genes KO Library	660	11,108	Medium	$2,799
Human Transcription Factors KO Library	1,639	11,364	Medium	$2,799
Human Metabolic Genes KO Library	2,981	30,290	Medium	$3,499
Human Kinase Domain-Focused KO Library	482	3,051	Medium	$2,399
Human Messenger-RBP KO Library	725	8,260	Medium	$2,799

Scale and titer for CRISPR lentivirus libraries

Scale	Application	Titer	Volume
Medium	Cell culture & in vivo	>10^8 TU/ml	1 ml (10x100 ul)
Plus	Cell culture & in vivo	>10^8 TU/ml	5 ml (50x100 ul)

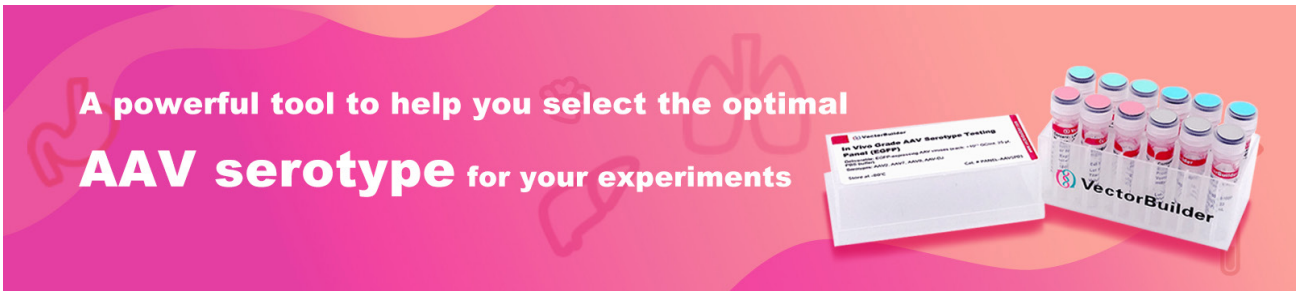
AAV Serotype Testing Panel

Adeno-associated viruses (AAVs) have emerged as the most effective viral vectors for gene therapy due to their ability to transduce a wide variety of mammalian cell types and their low immunogenicity in host organisms. VectorBuilder offers the AAV serotype testing panel to enable users to select the optimal AAV serotype for specific applications by systematic comparison of a variety of serotypes in cells or in animals.

Highlights

- High-titer, ready-to-use AAVs
- Option to select between either CMV- or CAG-driven EGFP reporter expression
- Flexibility to choose any 3 or more serotypes of your choice
- In vitro and in vivo grade panels
- Prices start at only $237 for in vitro panel and $417 for in vivo panel
- Comprehensive collection of AAV serotypes to select from

Product	Application	Titer & volume per unit	Unit price
In vitro grade AAV serotype testing panel (EGFP)	Cell culture	~10^{12} GC/ml, 25 ul	$79 per aliquot
In vivo grade AAV serotype testing panel (EGFP)	Cell culture & in vivo	~10^{13} GC/ml, 25 ul	$139 per aliquot



AAV Virus-Like Particles (VLPs)

VectorBuilder offers premade as well as custom AAV-like particles that can be used for a variety of applications during the development of AAV gene therapy vectors, including optimization of analytical assays, biodistribution assessment, and evaluation of in vivo immune responses of serotype-specific AAV capsids. Our AAV-like particles are extensively characterized and can therefore serve as reliable standards for evaluating the quality of AAV-like particles generated in house. Moreover, they can be used as negative controls in studies intended to demonstrate that an observed effect is caused by the expression cassette harbored by an AAV vector rather than its capsid.

Highlights

- Ready-to-ship AAV-like particles for serotypes 1, 2, 3, 5, 6, 8, 9, 2-retro, DJ, and DJ/8
- Custom services available for AAV-like particles produced using any desired serotype, production system, purification methods, or QC requirements
- Thoroughly characterized using various methods including SDS-PAGE, BCA, endotoxin testing, mycoplasma detection, and full/empty capsid ratio analysis

Price and turnaround

Scale*	Volume	Price	Turnaround
10 ug	25 ul	$399	In stock
100 ug	0.1 ml (1x100 ul)	$2,299	In stock
500 ug	0.5 ml (5x100 ul)	$8,399	In stock
1 mg	1 ml (10x100 ul)	$12,599	In stock

* 1 mg = $1.6x10^{14}$ VPs

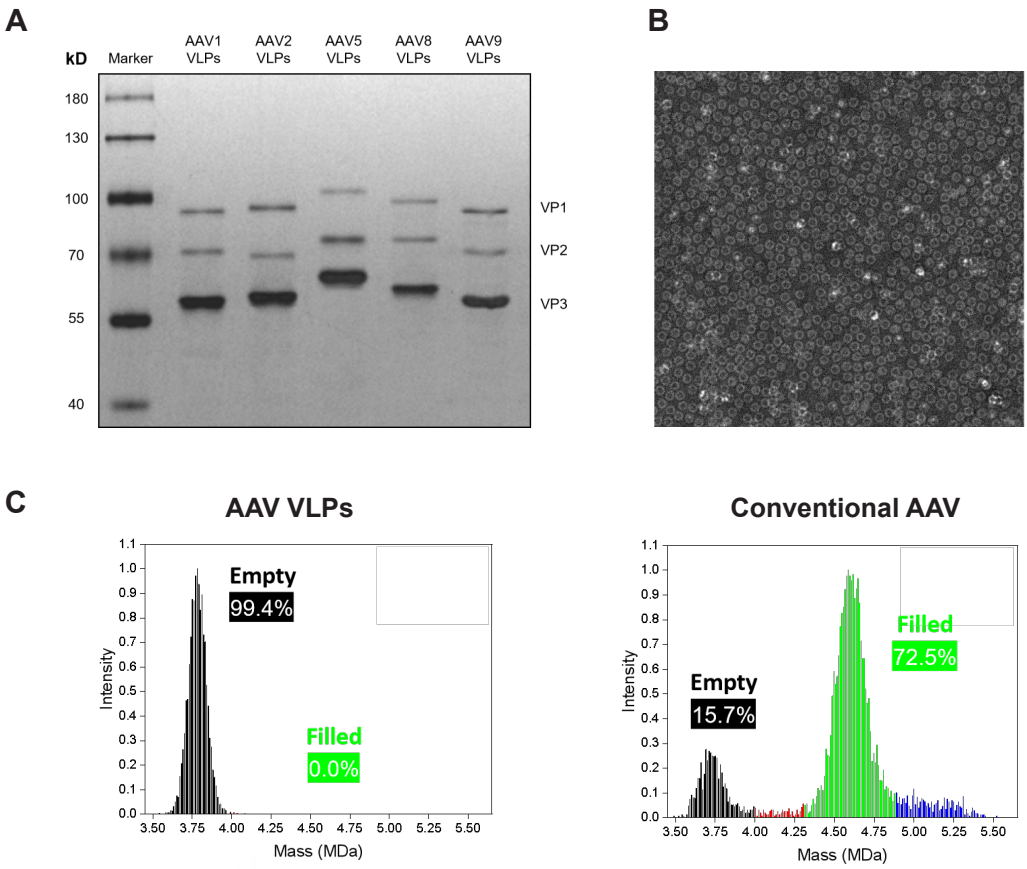


Figure 1. (A) Silver stained SDS-PAGE of ready-to-ship AAV virus-like particles of serotypes 1, 2, 5, 8, and 9. (B) Transmission electron microscopy of serotype 9 AAV virus-like particles showing empty (black-filled spheres) and filled (white-filled spheres) capsids. (C) Charge detection mass spectrometry analysis indicating percentages of empty (black) and filled (green) capsids for AAV virus-like particles and conventional AAV preparations of serotype 8.

IVT RNA and LNP-RNA

Price and turnaround

Product	Nucleotide	Scale	Price*
IVT mRNA			
EGFP IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$249
EGFP IVT mRNA	m1Ψ	100 ug (1 ug/ul, 1x100 ul)	$329
mCherry IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$249
mCherry IVT mRNA	m1Ψ	100 ug (1 ug/ul, 1x100 ul)	$329
Zebrafish EGFP IVT mRNA	Unmodified	10 ug (100 ng/ul, 100 ul)	$359
HiExpress™ Firefly Luciferase IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$299
HiExpress™ Firefly Luciferase IVT mRNA	m1Ψ	100 ug (1 ug/ul, 1x100 ul)	$369
HiExpress™ Gaussia Luciferase IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$299
HiExpress™ Gaussia Luciferase IVT mRNA	m1Ψ	100 ug (1 ug/ul, 1x100 ul)	$369
hSpCas9 IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$319
hSpCas9 IVT mRNA	m1Ψ	100 ug (1 ug/ul, 1x100 ul)	$399
HiExpress™ Chicken Ovalbumin IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$299
HiExpress™ Chicken Ovalbumin IVT mRNA	m1Ψ	100 ug (1 ug/ul, 1x100 ul)	$369
Anti-hCD19-h28zCAR IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$349
Anti-hCD19-hBBzCAR IVT mRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$349
IVT saRNA			
EGFP IVT saRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$749
EGFP IVT saRNA	m5C	100 ug (1 ug/ul, 1x100 ul)	$1,099
HiExpress™ Firefly Luciferase IVT saRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$799
HiExpress™ Firefly Luciferase IVT saRNA	m5C	100 ug (1 ug/ul, 1x100 ul)	$1,199
IVT circRNA			
IRES-EGFP IVT circRNA	Unmodified	100 ug (1 ug/ul, 1x100 ul)	$2,799
LNP-RNA			
EGFP LNP-mRNA	unmodified	100 ug (200 ug/ml, 500 ul)	$ 1,099
EGFP LNP-mRNA	m1Ψ	100 ug (200 ug/ml, 500 ul)	$ 1,199
HiExpress™ Firefly Luciferase LNP-mRNA	unmodified	100 ug (200 ug/ml, 500 ul)	$ 1,199
HiExpress™ Firefly Luciferase LNP-mRNA	m1Ψ	100 ug (200 ug/ml, 500 ul)	$ 1,299

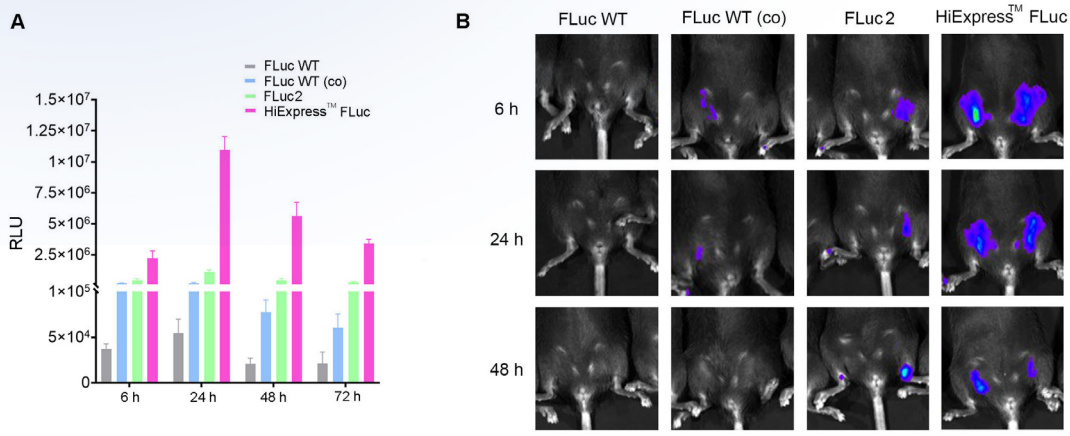


Figure 1. Firefly Luciferase IVT mRNA expression in vitro and in vivo (A) Expression of HiExpress™ Firefly Luciferase mRNA and other luciferase mRNA measured at 6 h, 24 h, 48 h, and 72 h post transfection. (B) Luciferase activity measured in adult mice injected intramuscularly with LNP encapsulated mRNA encoding wildtype (WT), codon-optimize (co), Luc2, or HiExpress™ luciferase.

VB UltraStable™ Chemically Competent Cells

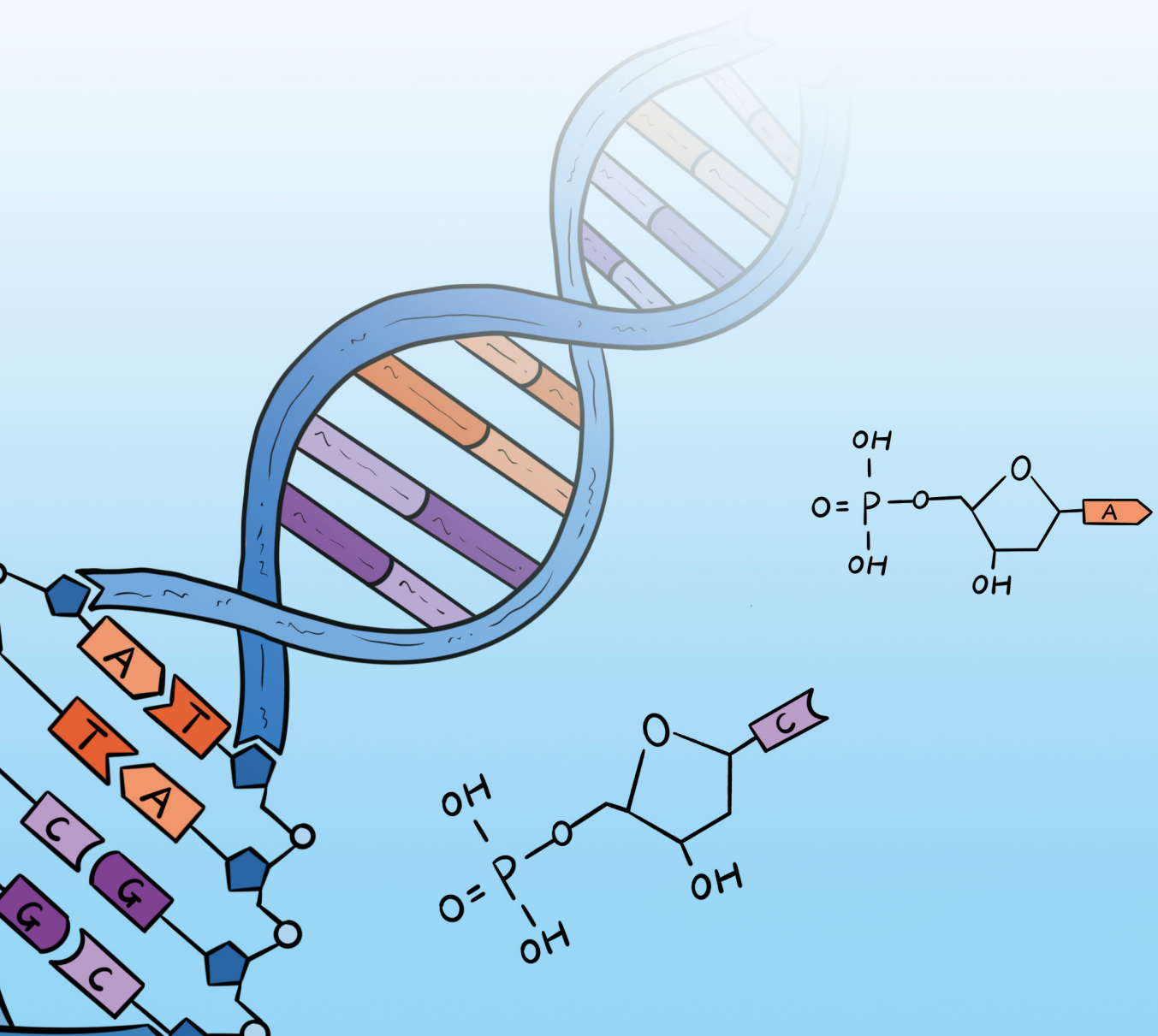
VB UltraStable™ chemically competent cells are designed for achieving high transformation efficiency (>1 x 10^9 cfu/ug) and propagation of DNA plasmids with unstable elements such as repeated sequences.

Highlights

- Lacks the ability to undergo homologous recombination due to mutations introduced in the recA gene
- Suitable for the cloning and hosting of lentiviral and retroviral vectors as well as vectors with repeated sequences and unstable fragments
- Deficient of the functional ccdAB operon making them suitable for highly efficient Gateway Cloning
- Can produce high-quality plasmid DNA due to the endA mutation (plasmids won't be digested by endonuclease)
- T1 phage resistant due to fhuA mutation
- Can be used for blue/white screening because it expresses the omega fragment of lacZ gene

Product name	Deliverable	Catalog no.	Price
VB UltraStable™ Chemically Competent Cells	10x100 ul	UC001-010	$199

Featured Offerings



CRISPR Genome Editing Solutions

VectorBuilder offers a variety of CRISPR products and services for in vitro and in vivo genome editing experiments at unbeatable prices and with rapid turnaround. Additionally, our online vector design platform features a free and user-friendly CRISPR design tool that allows you to design CRISPR vectors with high targeting efficiency.

Detailed descriptions of our CRISPR genome editing services, including ordering information, are available on the VectorBuilder website under ***Products & Services****.*

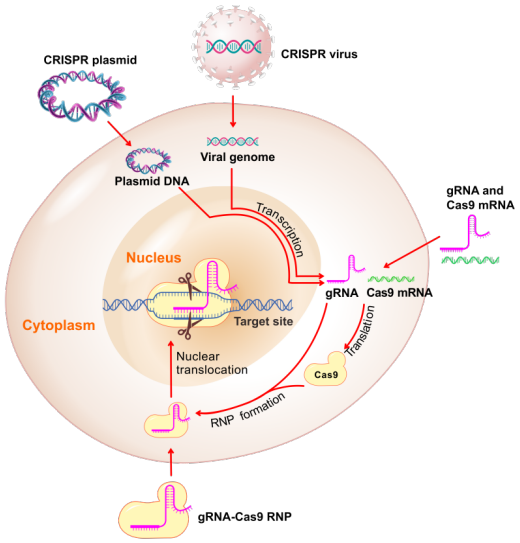


Figure 1. Overview of CRISPR genome editing solutions offered at VectorBuilder.

Custom CRISPR vectors

Vector type	Price	Turnaround
gRNA and Cas9* coexpression vectors	From $149	5-10 days
gRNA expression vectors	From $149	
Cas9* expression vectors	From $189	
Gene targeting donor vectors	From $659	10-20 days
CRISPR-based gene activation vectors	From $149	5-10 days
CRISPR-based gene inhibition vectors	From $149	
gRNA sensor vectors	From $299	9-18 days

* We offer a variety of Cas9 variants including hCas9, Cas9 (D10A), SaCas9, and many others.

Premade CRISPR vectors

Vector type	Price
Cas9 expression vectors	From $189
Scramble gRNA control vectors	From $149
Cas9 and scramble gRNA coexpression vectors	From $149
CRISPRa and CRISPRi helper vectors	From $189

CRISPR virus

Lentivirus, AAV, and adenovirus are widely used to deliver CRISPR components into mammalian cells. VectorBuilder offers premium-quality virus packaging services for lentivirus, AAV, and adenovirus for achieving highly efficient CRISPR targeting in difficult-to-transfect cells. *(See page 19 for detailed information on our virus packaging services.)*

Cas9 mRNA and gRNA

VectorBuilder provide transfection-ready and microinjection-ready Cas9 mRNA and gRNA specifically designed against user-selected target sites for easy RNA-based delivery of CRISPR components into mammalian cells.

Reagent	Concentration & volume	Price	Turnaround
hCas9 mRNA	>500 ng/ul, 25 ul	$449	2-4 days
Cas9(D10A) mRNA			
Custom gRNA*		$349	

* Cloning of gRNA in vitro transcription vector has an additional cost of $149 and turnaround of 5-10 days.

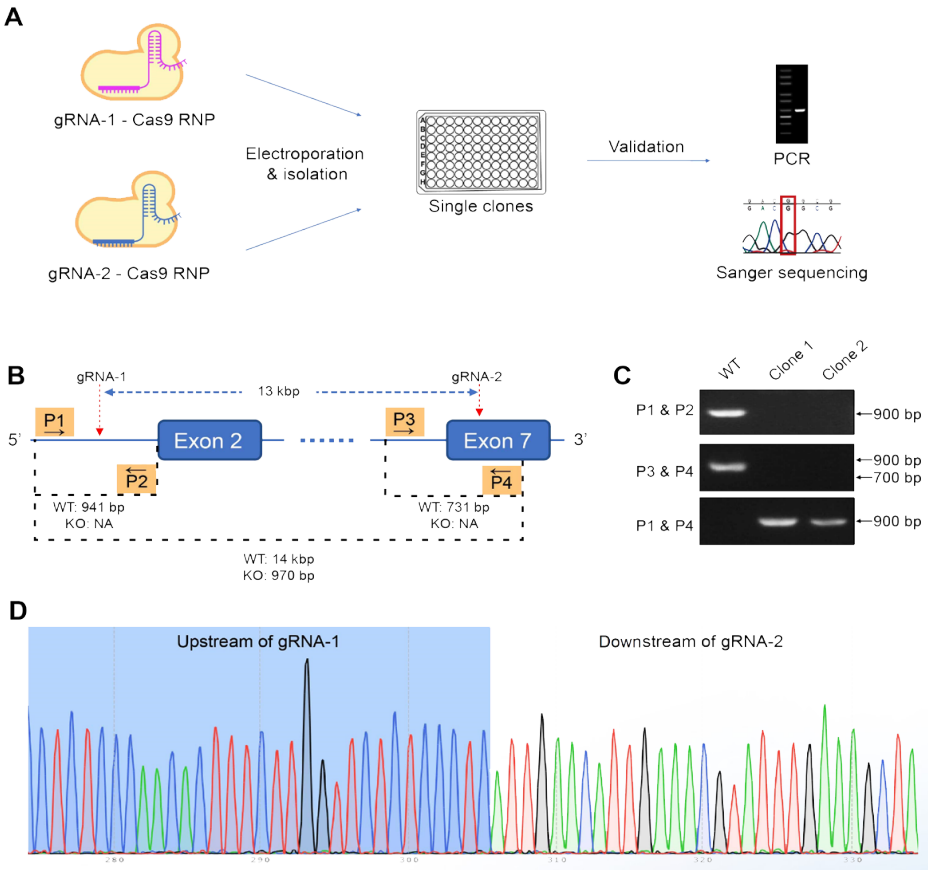


Figure 2. Generating homozygous CD274 knockout (KO) mutants using the gRNA-Cas9 ribonucleoprotein (RNP) approach. (A) The RNP is electroporated into target cells, and single clones are isolated and validated by PCR and Sanger sequencing. (B) RNP binding to two sites on the targeted gene to KO a 13-kbp region. (C) Three PCR reactions using primer combinations (P1-P4) confirmed clones are homozygous KO mutants, confirmed by (D) sequencing results.

Cas9 protein

VectorBuilder offers purified wild-type Streptococcus pyogenes Cas9 protein (SpCas9) and the Cas9 nickase (Cas9(D10A)) for preparing preformed Cas9-gRNA RNP to deliver CRISPR components into mammalian cells.

Reagent	Concentration & volume	Price	Turnaround
SpCas9 protein	100 ug	$599	5-7 days
SpCas9(D10A) nickase protein			

Gene targeting donor DNA

VectorBuilder offers donor DNA templates in the form of single-stranded oligodeoxynucleotide (ssODN) or dsDNA from linearized plasmids for guiding HDR-based DNA

Reagent	Price	Turnaround
ssODN (normally 120-200 nt)	From $349	2-3 weeks
Gene targeting donor vector	From $659	10-20 days

Pooled CRISPR libraries

VectorBuilder specializes in the custom design and construction of a variety of pooled CRISPR libraries such as CRISPR knockout, CRISPRa/i, and CRISPR barcode libraries. In addition to custom pooled CRISPR libraries, we offer premade dual-gRNA lentivirus libraries for whole-genome knockout screens of human and mouse genes. *(See page 54 for detailed information on our premade dual-gRNA CRISPR libraries.)*

CRISPR knockout and knockin stable cell lines

VectorBuilder can generate stable cell lines with a permanent knockout of your GOI using a CRISPR-based approach. A pair of gRNAs targeting the GOI is introduced into the cells along with Cas9, which leads to the generation of two cuts on the target gene. Attempts by cells to repair the broken ends of the two cut sites typically result in a large deletion spanning the two sites. In addition, we can generate stable cell lines with permanent knockin of your GOI at desired genomic target sites. Stable knockin of the GOI is achieved by introducing a target site-specific gRNA into the cells along with Cas9 and a donor vector which serves as the template for HDR-mediated gene knockin. Using a similar approach, we can also generate stable cell lines harboring desired point mutations at genomic target sites of interest. In this case, a target site-specific gRNA is introduced into the cells along with Cas9 and a ssODN which serves as the template for HDR-mediated insertion of the point mutation.

The final cell line is evaluated by Sanger sequencing of the targeted locus to confirm knockout, knockin, or the presence of the point mutation. Additionally, a series of standard QC assays, such as sterility tests and mycoplasma detection, are performed before releasing the final cell line products. *(See page 34 for detailed information on our stable cell line generation service.)*

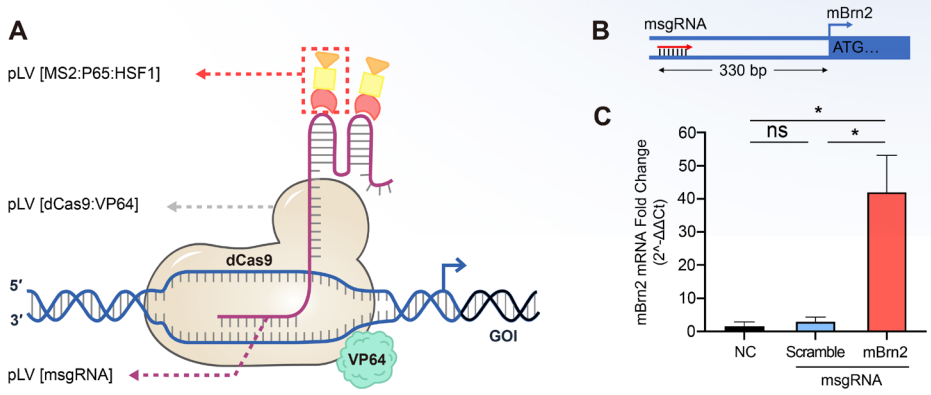


Figure 3. Up-regulation of gene expression achieved by the lentivirus-based CRISPRa. (A) Illustration of SAM-regulated transcriptional activation. (B) Diagram of msgRNA design targeting the promoter region of the mouse Brn2 gene. (C) Relative gene expression of Brn2 in cells transduced with scramble or targeting msgRNA or no treatment control (NC).

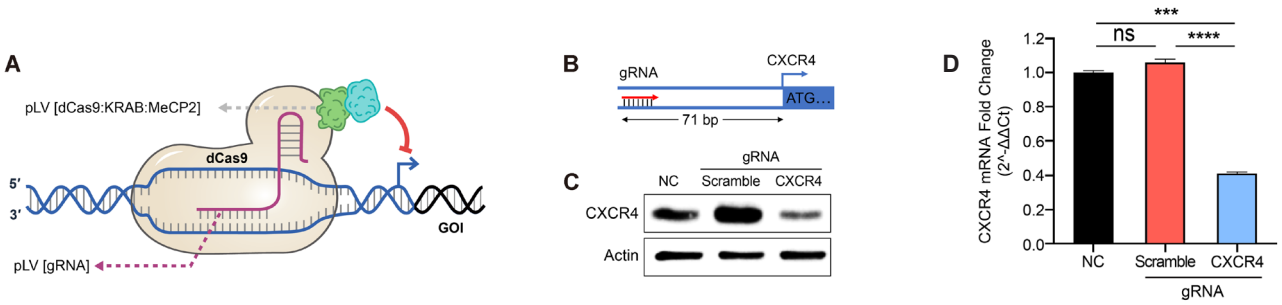


Figure 4. Down-regulation of gene expression achieved by the lentivirus-based CRISPRi. (A) Illustration of dCas9/KRAB/MeCP2-regulated transcriptional inhibition. (B) Diagram of gRNA design targeting the promoter region of the human CXCR4 gene. (C) CXCR4 protein levels in cells transduced with scramble or targeting gRNA or no treatment control (NC), measured by western blot or (D) qRT-PCR.

Inducible Gene Expression Solutions

VectorBuilder offers a comprehensive collection of Tet-inducible gene expression system reagents to help you achieve nearly complete silencing of your GOI in the absence of tetracycline or its analogs (e.g. doxycycline), and rapid, robust expression in response to the addition of tetracycline or its analogs.

Highlights

- Utilizes the rtTA/tTS fusion cassette to achieve maximal induction in the presence of tetracycline and minimal leaky expression in its absence
- Available in dual-vector and all-in-one formats
- Low-leak, tissue-specific vectors available with minimal leaky expression in non-target tissues in the absence of tetracycline
- Available in a variety of backbones, including regular plasmid, lentivirus, AAV, adenovirus, and piggyBac

Custom Tet vectors

Vector type	Price	Turnaround
All-in-one Tet-On vectors	From $239	5-10 days
Tet regulatory protein expression vectors	From $189	
TRE driven GOI expression vectors		
Low-leak Tet-On vectors		

Popular Tet vectors

Vector type	Price
Tet-inducible vectors for EGFP, mCherry, TagBFP, or luciferase	$189
All-in-one Tet-On vectors for EGFP, mCherry, TagBFP, or luciferase	$239
Tet regulatory protein expression vectors	$189

Tet-inducible stable cell lines

VectorBuilder can custom-build Tet inducible gene expression stable cell lines with minimal background expression and high induction of your GOI(s). Additionally, we can generate Tet regulatory protein expression stable cell lines (e.g. rtTA, tTS/rtTA, etc.) which can then be transfected and transduced with plasmids and viruses carrying TRE-driven GOI(s) for flexible experimental design and reliable Tet inducible gene expression. For Tet-On stable cell lines, induction of the GOI is validated by RT-qPCR. What's more, a series of standard QC assays, such as sterility tests and mycoplasma detection, are performed before releasing the final cell line products.

Tet-inducible virus

VectorBuilder can design, construct, and package a variety of viral vectors expressing the components of the Tet-inducible system to help you achieve virus-mediated inducible expression of your target genes in difficult-to-transfect cell lines. We can package recombinant lentivirus, AAV, adenovirus, MMLV, and MSCV retrovirus. *(See page 19 for detailed information on our virus packaging services.)*

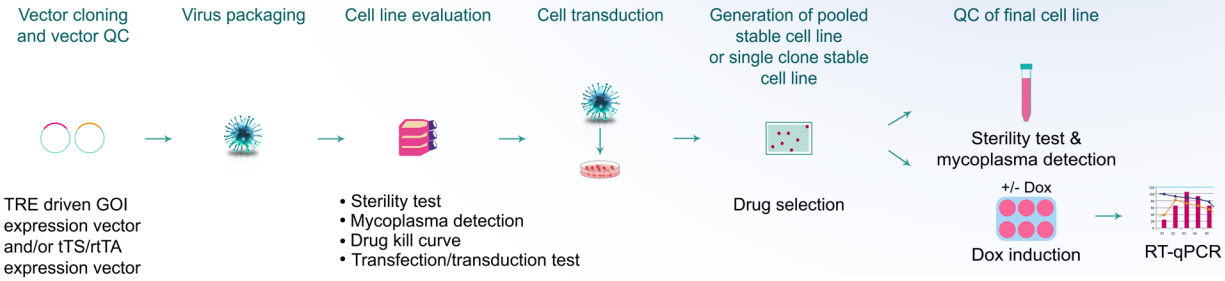


Figure 1. Workflow for Tet-inducible cell line generation process.

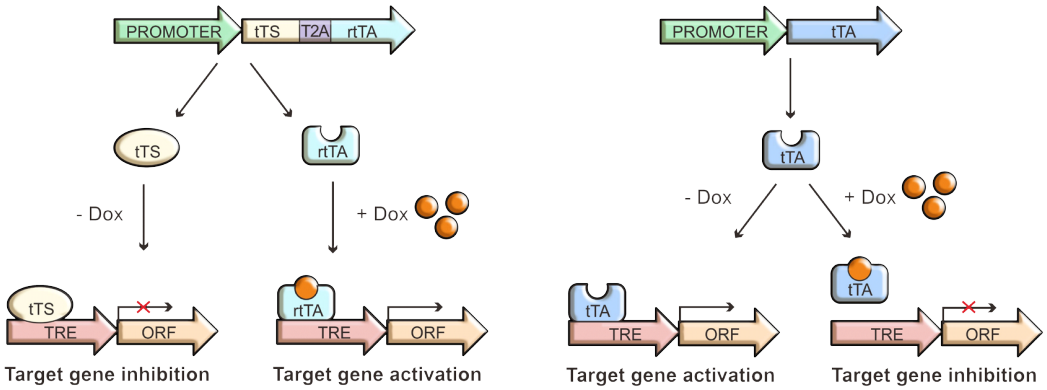


Figure 2. Mechanisms of Tet regulated gene expression using Tet-On and Tet-Off systems. Dox: doxycycline (tetracycline analog)

shRNA Gene Knockdown Solutions

VectorBuilder offers a comprehensive collection of shRNA reagents to provide you with the ideal tools for your gene knockdown experiments. We can provide both U6-based and miR-30 based shRNA systems to give you the flexibility to control shRNA expression in different ways based on your experimental needs. Additionally, our online vector design tool is integrated with shRNA databases, enabling you to easily select suitable shRNAs targeting your GOI while designing your shRNA vectors.

Highlights

- Free and intuitive vector design tool with integrated shRNA databases for human, mouse, and rat models
- Versatile control of shRNA expression by either U6 or miR30
- Vast collection of backbones, including regular plasmid, lentivirus, AAV, adenovirus, and piggyBac
- Premade and custom-made shRNA library options
- Powerful technical support for shRNA selection, vector design, and troubleshooting

Custom shRNA vectors

Vector type	Price	Turnaround
U6-based shRNA vectors	From $149	5-10 days
miR30-based shRNA vectors	From $299	8-16 days
U6-based inducible shRNA vectors	From $149	5-10 days
shRNA sensor vectors (for testing shRNA efficiency)	Please inquire	

Popular shRNA vectors

Vector type	Price
Scramble shRNA vectors	From $149
Anti-EGFP shRNA vectors	
Anti-mCherry shRNA vectors	
Anti-luciferase shRNA vectors	
Anti-lacZ shRNA vectors	

shRNA knockdown stable cell lines

VectorBuilder can custom-build shRNA knockdown stable cell lines for applications requiring long-term knockdown of your GOI. We identify the top three candidate shRNAs based on the knockdown score to ensure efficient knockdown of your GOI. We then use the shRNA with the best knockdown efficiency to generate the stable cell line via lentivirus transduction. The knockdown level of the cell line is validated by RT-qPCR. Additionally, we perform a series of standard QC assays, such as sterility tests and mycoplasma detection, before releasing the final cell line products. *(See page 34 for detailed information on our stable cell line generation services.)*

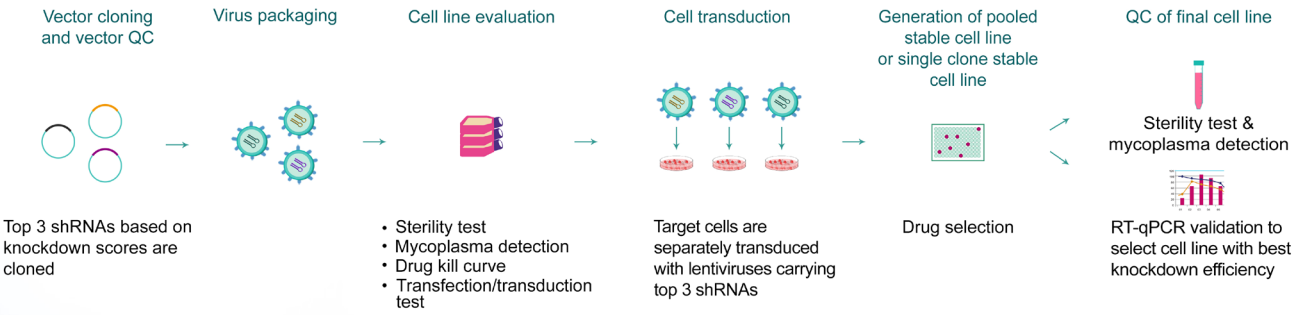


Figure 1. Workflow for our shRNA knockdown stable cell line generation process.

shRNA virus

Viral vectors are the preferred shRNA delivery vehicles given their ability to efficiently transduce a wide variety of cell types and achieve long-term knockdown of the targeted genes. We can design and construct shRNA vectors in various viral vector formats, including lentivirus, AAV, and adenovirus. *(See page 19 for detailed information on our virus packaging services.)*

shRNA (3+1) virus packaging

VectorBuilder offers shRNA (3+1) virus packaging services which include 3 custom shRNA viruses targeting your GOI and 1 scramble control virus, enabling you to test multiple shRNA against your target genes at highly affordable prices.

Pooled shRNA libraries

VectorBuilder specializes in the design and construction of pooled shRNA libraries to perform large-scale, loss-of-function screens in mammalian cells. In addition, VectorBuilder offers premade whole-genome shRNA libraries for human and mouse genes that have been validated by NGS. *(See page 32 for detailed information on our library construction services.)*

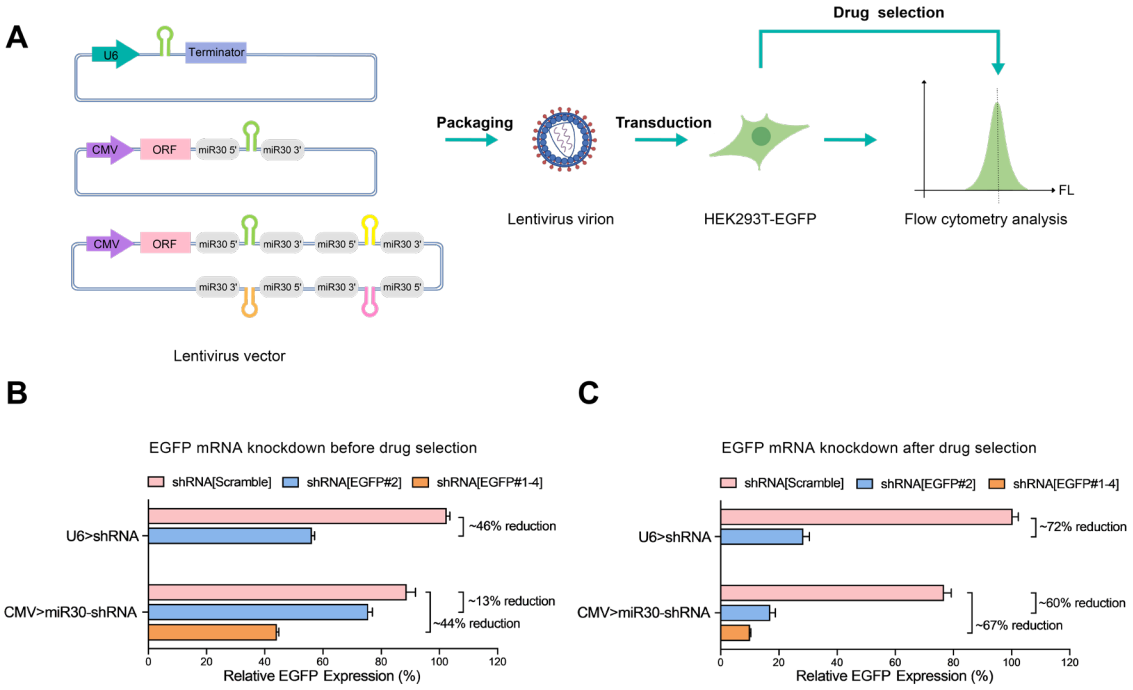


Figure 2. Comparisons of EGFP knockdown through U6-based versus miR30-based shRNA lentiviral systems. (A) Lentiviral vectors shRNAs were packaged into lentiviral particles and transduced into EGFP-expressing cells, followed by measurement using flow cytometry before (B) and after (C) drug selection. (B) Before drug selection, EGFP expression was reduced by ~46% thru U6-based shRNA, by 13% thru CMV-driven miR30-based single shRNA, and by 44% thru quad shRNA. (C) After drug selection, EGFP expression was reduced by ~72% thru U6-based shRNA, by 60% thru CMV-driven miR30-based single shRNA, and by 67% thru quad shRNA.

shRNA (3+1) Virus Packaging

The knockdown effects of empirically designed shRNAs are often limited by variations in specificity and efficiency observed from one shRNA to another. Therefore, it is important to test multiple shRNAs to find the most potent shRNA for knocking down your GOI. VectorBuilder's shRNA (3+1) virus packaging services enable you to select optimal shRNAs for your target genes at highly affordable prices. This offering includes cloning and packaging three custom shRNA viruses targeting your GOI and one scramble control virus. Currently available viral types include lentivirus, AAV and adenovirus.

Price and turnaround

Virus type	Scale	Application	Price*	Turnaround**
Lentivirus	Mini	Cell culture	$899	10-19 days
	Pilot		$1,499	
	Medium		$1,999	
	Large		$2,999	
	Ultra-purified medium	Cell culture & in vivo	$3,999	
	Ultra-purified large		$4,799	
AAV	Pilot	Cell culture	$1,499	10-19 days
	Medium		$1,999	
	Large		$2,999	
	Ultra-purified pilot	Cell culture & in vivo	$4,199	11-21 days
	Ultra-purified medium		$5,699	
	Ultra-purified large		$8,799	
Adenovirus	Pilot	Cell culture	$2,399	34-47 days
	Medium		$3,599	
	Large		$4,699	
	Ultra-purified medium	Cell culture & in vivo	$6,199	34-47 days
	Ultra-purified large		$7,499	

* Price includes the cost of both vector cloning and virus packaging.

** Turnaround includes the production time for both vector cloning and virus packaging.

Save Money with VectorBuilder Store Credit

Desired Credit	You Pay	You Save
$10,000	$9,419	$581
$20,000	$18,523	$1,477
$30,000	$27,444	$2,556
$40,000	$36,196	$3,804
$50,000	$44,891	$5,109
$60,000	$53,511	$6,489
$70,000	$62,021	$7,979
$80,000	$70,532	$9,468
$90,000	$79,043	$10,957
$100,000	$87,553	$12,447
$200,000	$171,146	$28,854

VectorBuilder Store Credit is calculated using a graduated bonus rate system.

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