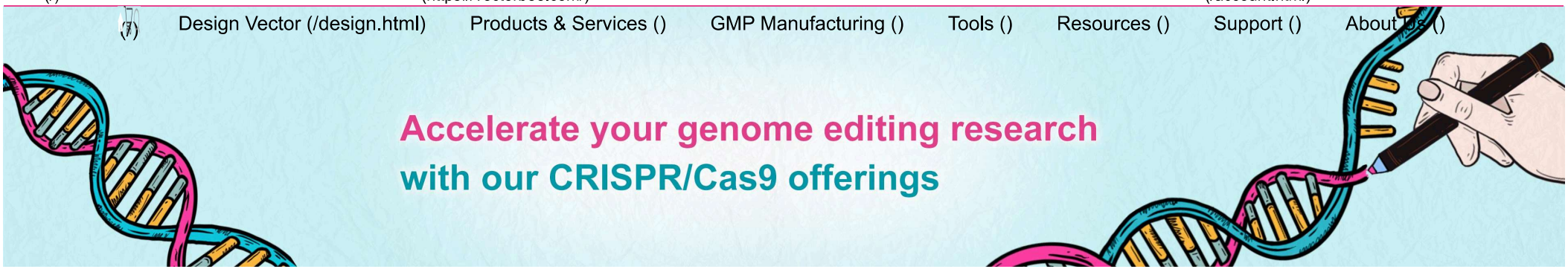

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- Vector Cloning (/products-services/service/vector-cloning.html)
- Plasmid DNA Preparation (/products-services/service/plasmid-dna-preparation.html)

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- Lentivirus (/products-services/service/lentivirus-packaging.html)
- Adeno-Associated Virus (AAV) (/products-services/service/aav-packaging.html)
- Adenovirus (/products-services/service/adenovirus-packaging.html)
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CRISPR Genome Editing Solutions

VectorBuilder offers a comprehensive collection of CRISPR products and services for in vitro and in vivo genome editing. We provide ready-to-use CRISPR reagents including plasmid vectors, viruses, IVT RNAs and LNPs, pooled libraries, stable cell lines, and more for various experimental needs.

Highlights

Customizable: Our free, highly intuitive online vector design studio (/design.html#Mammalian_CRISPR_Gene_Editing_parent) enables unlimited designs of your CRISPR vectors.

Comprehensive: Knockout, knockin, and CRISPRa/i with Cas9 variants available in various gene delivery formats (/resources/vector-academy/lessons/crispr-delivery-systems.html).

Streamlined: Full service from experimental design through stable cell line engineering and library screening.

Integrated Technical Expertise

Expertise: Excellent quality, fast turnaround, and competitive pricing with powerful technical support.

What We Offer

Design My Vector (/design.html#div-mammalian-crispr-gene-editing-vectors)

CRISPR Vectors

CRISPR Virus

IVT RNA and LNP

Request Design Support (/design/request.html)

Cas9 Protein

MSCV Retrovirus (/products-services/service/mscv-retrovirus-packaging.html)
Baculovirus (/products-services/service/baculovirus-packaging.html)
Vesicular Stomatitis Virus (VSV) (/products-services/service/vsv-packaging.html)
Herpes Simplex Virus (HSV) (/products-services/service/herpes-simplex-virus-(hsv).html)
Vaccinia Virus (VACV) (/products-services/service/vaccinia-virus.html)
Rabies Virus (RABV) (/products-services/service/rabv-packaging.html)

CRO Services

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Library Screening (/products-services/service/library-construction.html)
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Antibody Discovery (/products-services/service/antibody-discovery.html)
AAV Capsid Evolution (/products-services/service/library-construction/aav-capsid-evolution.html)
AAV Biodistribution Profiling (/products-services/service/aav-biodistribution.html)
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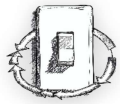
BAC Recombineering (/products-services/service/bac-recombineering.html)
Mutagenesis (/products-services/service/mutagenesis.html)

Empowered by our free, user-friendly online design platform, you can easily design and order custom and premade CRISPR vectors for all kinds of gene editing and regulation experiments.

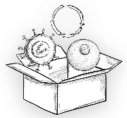
CRISPR gene editing vectors

All-in-one and dual-vector formats available in a variety of non-viral, viral, and transposon backbones for targeted knockout and knockin. (/design.html#Mammalian_CRISPR_Gene_Editing_parent)



CRISPR gene regulation vectors

Optimized CRISPRa and CRISPRi systems for efficient endogenous gene activation or inhibition. (/design.html#Mammalian_CRISPR_Gene_Regulation_parent)



Premade CRISPR vectors

A rich collection of premade Cas9 vectors, gRNA vectors, and helper vectors for CRISPRa/i ready for immediate shipment as E. coli stocks. (/products-services/product/popular-vectors/premade-crispr-vectors.html)

VectorBuilder is the one-stop provider for all your custom CRISPR needs.

Contact Us (/design/request.html)

Design Tips

Category	Recommendation
CRISPR vector components	• All-in-one vectors for simplicity and co-expression of Cas9 and gRNA in difficult-to-transfect cells. • Separate vectors for easier-to-transfect cells and if using modified or larger Cas proteins with accessory components like KRAB or VP64. Find more information here (/resources/vector-academy/gene-delivery-spotlight/optimizing-crispr.html).
gRNA	• Single gRNAs for simple knockouts or gene regulation. • Dual gRNAs when using Cas9 nickase, deleting DNA fragments, or targeting two genes simultaneously. Find more information here (/resources/faq/single-vs-dual-gRNA.html).

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(/) manufacturing/overview.html)
Overview (/gmp-manufacturing/overview.html)
CliniVec™ Consultation Service (/gmp-manufacturing/clinivec.html)
Plasmid Manufacturing (/gmp-manufacturing/plasmid-manufacturing.html)
Viral Vector Manufacturing (/gmp-manufacturing/virus-manufacturing.html)
IVT RNA and LNP Manufacturing (/gmp-manufacturing/lnp-RNA-manufacturing.html)
MiniVec™ Plasmid (/products-services/service/minivec.html)
Virus Packaging Plasmids (/gmp-manufacturing/packaging-plasmids.html)

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Premade Libraries
Premade Stable Cell Lines (/products-services/product/premade-stable-cell-lines.html)
Premade IVT RNA and LNP-RNA (/products-services/product/RNA-LNP.html)
LentiBuilder™ Lentivirus Packaging Kit (/products-services/product/lentivirus-packaging-kit.html)
Research Antibodies (/products-services/product/antibodies.html)
VB UltraStable Competent Cells (/products-services/product/competent-cell.html)

Featured Offerings

MiniVec™ Plasmid (/products-services/service/minivec.html)

	• SpCas9 for conventional gene editing, dCas9 for gene regulation, Cas9 nickase for introducing single-stranded breaks, SaCas9 for AAV-based experiments, base and prime editors for introducing gene modifications without causing double-stranded breaks.
PAM and gRNA compatibility	• gRNAs designed near PAM sequences compatible with the selected Cas9. • PAM sequence is NGG for SpCas9 and NNGRRT for SaCas9.
Reporter systems	• Selectable markers and reporters for effective identification and isolation of transduced cells (e.g. antibiotic selection for successful introduction of CRISPR components and fluorescent reporters to assess transfection

View More ()

Technical Information

CRISPR-mediated genome editing | CRISPR-mediated gene regulation | CRISPR delivery approaches | gRNA databases

The CRISPR system can be used for a growing variety of applications, and each CRISPR approach requires at least two basic components: a Cas protein and guide RNA (gRNA). The most commonly used Cas endonuclease is engineered from Streptococcus pyogenes (a.k.a. SpCas9 or, with codon optimization for expression in human cells, hCas9). It is an RNA-guided DNA nuclease which can generate double-strand breaks (DSBs) at target sites (Figure 1). Cas9 is localized to a target site in the host genome by the complementary gRNA, and the DSB is introduced if the gRNA was designed to target a region immediately adjacent to a Protospacer Adjacent Motif (PAM). The PAM sequence is dependent on the particular Cas enzyme being used: for SpCas9, the PAM sequence is NGG or NAG (orange DNA in Figure 1).

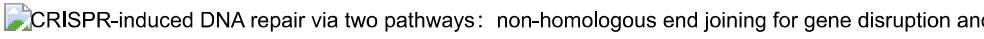

Figure 1. Mechanisms of CRISPR-induced DNA repair to produce gene knockout or precise sequence changes.

Once DSBs are generated by the CRISPR system, cells most commonly activate the non-homologous end joining (NHEJ) pathway to repair the DNA breaks, which usually results in small random deletions, or more rarely insertions and base substitutions. When these mutations disrupt a protein-coding region (e.g. a deletion causing a frameshift), they may lead to functional gene knockout. Dual gRNAs can be introduced with Cas9 to create two DSBs, thereby deleting a DNA fragment located between the two target sites (Figure 4), or dual gRNAs can be used to target two different genes simultaneously.

Alternatively, and less efficiently, DSBs can be repaired via the homology-directed repair (HDR) pathway when a DNA template is present. When donor DNA is introduced with the CRISPR components, HDR can result in replacement of the target genomic DNA sequence with the donor sequence, generating precise changes such as point mutations or knockin. The donor DNA template can be a single-stranded oligo nucleotide (ssODN) or a dsDNA fragment (usually linearized DNA derived from either regular plasmid or AAV). ssODNs are suitable for introducing point mutations or small tag insertions, while dsDNA fragments are widely used to introduce large fragment knockins like targeted stable integration of transgenes.

Another widely used Cas9 variant, Cas9 “nickase” (e.g. Cas9(D10A)), generates single-stranded cuts in DNA. If Cas9 nickase is used in conjunction with two gRNAs targeting the two opposite strands flanking a single target region, the nickases will generate two single-stranded cuts, one on each strand, resulting in wide-spread DSBs around the target region as shown in Figure 2. Because single nicks are generally repaired with high fidelity, efficient cleavage occurs only when both offset gRNAs bind correctly, creating a staggered DSB. This double-nicking strategy, therefore, dramatically reduces off-target activity while maintaining high on-target efficiency at many loci.

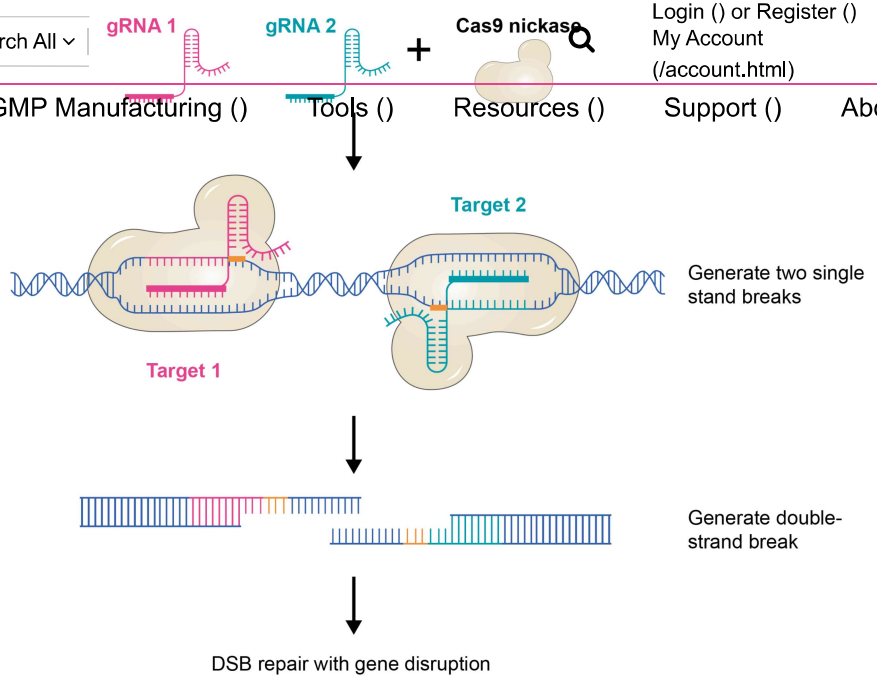

Figure 2. Nickase activity with two gRNAs.

Visit Vector Academy (https://en.vectorbuilder.com/resources/vector-academy/page/1.html?tag=CRISPR) for educational resources to help you successfully plan, execute, and troubleshoot your CRISPR experiments including choosing the right CRISPR delivery system (/resources/vector-academy/lessons/crispr-delivery-systems.html) and CRISPR vector component selection (/resources/vector-academy/gene-delivery-spotlight/optimizing-crispr.html) for experimental success.

Case Studies

CRISPR-mediated genome editing | CRISPR-mediated gene regulation | CRISPR delivery approaches

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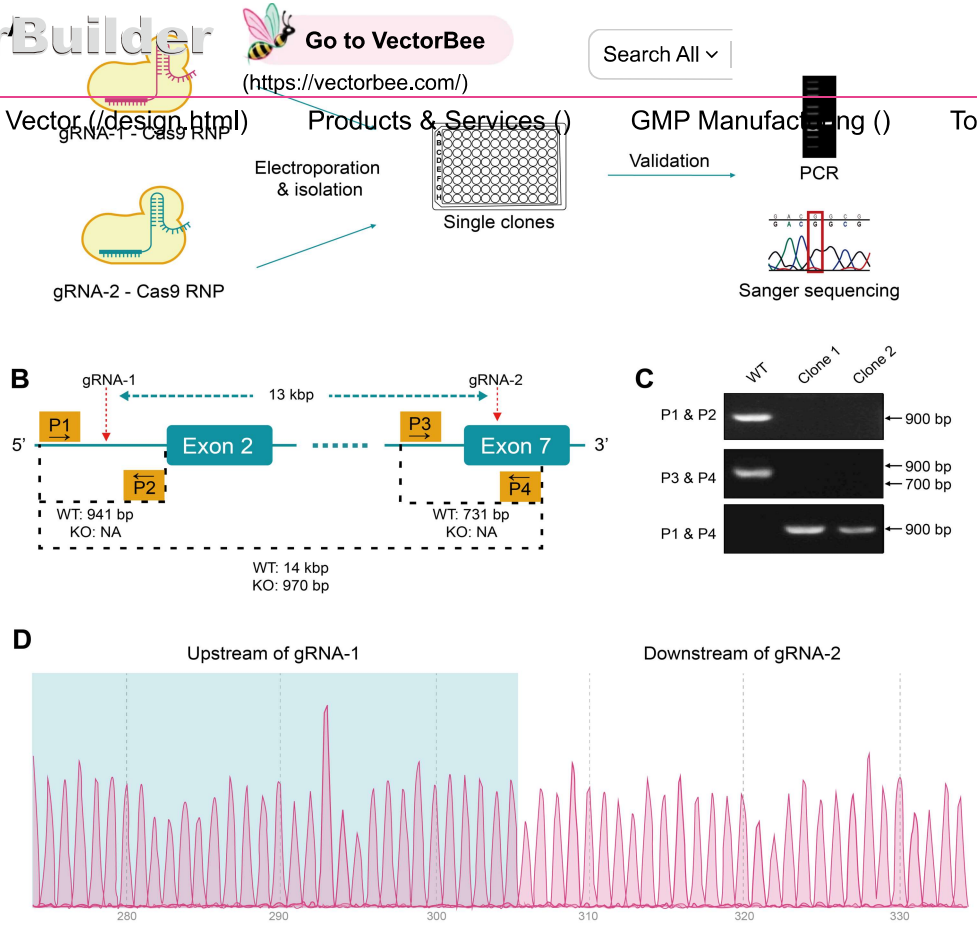

Figure 4. Generating homozygous knockout (KO) mutants using the gRNA/Cas9 ribonucleoprotein (RNP) approach with dual gRNAs for deletion of a DNA fragment. (A) The editing RNP is electroporated into target cells with two sites on the targeted gene to delete a 13 kb region, and single clones are isolated and screened. The genotypes of the candidates are validated using PCR and Sanger sequencing. (B) Four primers, P1 to P4, were used in three PCRs to differentiate KO and WT clones. Based on the (C) PCR results, clone 1 is validated to be homozygous KO mutant, which is also confirmed by (D) sequencing results.

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What are the pros and cons of shRNA knockdown vs. CRISPR knockout?

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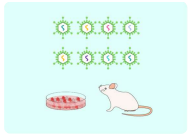
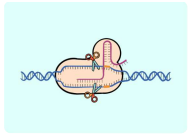


CRISPR Library Screening Made Simple | Part 1: Setting Up for Success (/resources/vector-academy/lessons/CRISPR-Library-Screening-Part-1.html)



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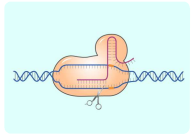

Optimizing CRISPR: Technology and Approaches for High Efficiency Gene Editing (/resources/vector-academy/gene-delivery-spotlight/optimizing-crispr.html)

Video Gallery

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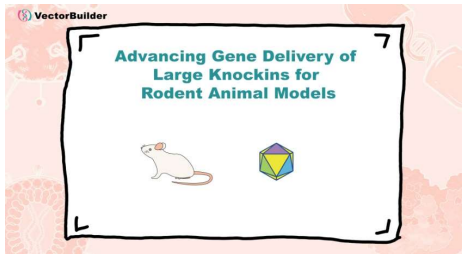
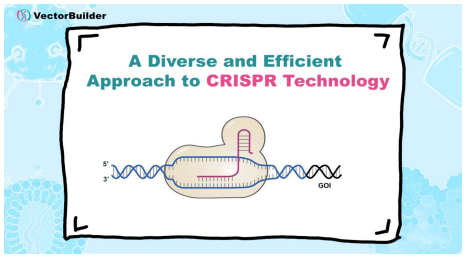
Advancing Gene Editing Strategies for Efficient Genetic Improvements in Animal Models



Advancing Gene Delivery of Large Knockins for Rodent Animal Models



A Diverse and Efficient Approach to CRISPR Technology

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