Catalogue

Enzymes for molecular biology

For research use only. Not for use in diagnostic procedures.

Lucigen®

BIOSEARCH™ TECHNOLOGIES

GENOMIC ANALYSIS BY LGC

Contents

Enzymes for molecular biology

About LGC, Biosearch Technologies and Lucigen

Lucigen® is now part of LGC, Biosearch Technologies, providing an expanded portfolio of products and services for agrigenomics and molecular diagnostics.

Biosearch Technologies is working to improve people's lives by providing quality products and services to life science and healthcare professionals. Biosearch Technologies offers products and services that enable life-science professionals to perform their research and testing more efficiently and effectively. The company has grown to manufacture and sell over 325 biomedical research products and services to customers worldwide, all under an ISO 13485-certified quality system. Core competencies include protein expression and purification, enzymes and reagents, competent cells and cloning, PCR and isothermal amplification, next gen sequencing, and assay design for molecular diagnostics.

Custom and OEM Solutions

Your needs are unique. Your solutions should be, too.

Biosearch Technologies specialises in custom and OEM manufacture of high-quality enzymes and competent cells for an array of diagnostic and research applications. We can customise our catalog enzyme concentration, formulation, dispensing, packaging and labeling - including private labels. And, we'll provide knowledgeable scientific support for your project from start to finish.

Here's why partnering with Biosearch Technologies could be right for you:

Speed your development with responsive manufacturing, rapid order turn-around, and on-time delivery.

- Use our in-house expertise in a broad array of enzyme classes, applications, and technologies.
- Leverage our quality in ISO 13485-certified quality system.
- Proceed with confidence as our scientists support your project at every step.
- Complete your workflow with our diverse offering - from polymerases and proteases to Cas9 Nuclease.

Mesophilic DNA polymerases

Product name	Activity				
	5′→3′ exonuclease	3′→5′ exonuclease	Optimum temp.	Heat inactivation[a]	Strand displacement
Bst DNA Polymerase, Exonuclease Minus	–	–	55–65 °C	80 °C for 20 minutes	++++
NxGen phi29 DNA Polymerase	–	++	30 °C	65 °C for 10 minutes	+++++
Exo-Minus Klenow DNA Polymerase (D355A, E357A)	–	–	37 °C	n.d.	+

[a] Indicated treatment results in complete inactivation under standard reaction conditions; n.d., not determined.

Thermophilic DNA polymerases

Product name	Activity				
	5′→3′ exonuclease	3′→5′ exonuclease	Optimum temp.	Thermostability[a]	Fidelity[b]
EconoTaq DNA Polymerase	+	–	70–72 °C	n.d.	n.d.
MasterAmp *Taq* DNA Polymerase	+	–	70–72 °C	10 minutes at 97 °C	0.38–1.82 x 10^4
MasterAmp *Tth* DNA Polymerase	+	–	68–74 °C	10 minutes at 97 °C	2.2 x 10^4
LavaLAMP® DNA Enzyme	n.d.	–	68–74 °C	n.d.	n.d.
LavaLAMP® RNA Enzyme	n.d.	–	68–74 °C	n.d.	n.d.

[a] Values represent half-lives: 50% of the enzymatic activity is retained after the given time at the stated temperature.
[b] Defined as the average number of correct nucleotides a polymerase incorporates before making an error; n.d., not determined.

RNA polymerases

Product name	Activity			
	5′→3′ exonuclease	3′→5′ exonuclease	Optimum temp.	Heat inactivation
NxGen T7 RNA Polymerase	–	–	37 °C	n.d.
T7 R&DNA Polymerase	–	–	37 °C	n.d.
Poly(A) Polymerase	–	–	37 °C	not recommended

n.d., not determined.

Reverse transcriptases

Enzyme	Activity	Substrates	RNase H activity	Optimum temp.	Heat inactivation
MMLV High Performance Reverse Transcriptase	Synthesises first-strand cDNA	ssRNA, ssDNA	+	37 °C	85 °C for 5 minutes
NxGen M-MuLV Reverse Transcriptase	Synthesises first-strand cDNA	ssRNA, ssDNA	+	37–42 °C	85 °C for 10 minutes
EpiScript RNase H⁻ Reverse Transcriptase	Synthesises first-strand cDNA	ssRNA, ssDNA	–	37 °C	85 °C for 5 minutes

Enzyme properties
Enzymes for molecular biology

DNA endonucleases

Enzyme	Substrate	Activity	Products	Applications	Optimum temp.	Heat inactivation
Baseline-ZERO DNase	dsDNA and ssDNA	Digests dsDNA or ssDNA to mononucleotides. In presence of Mg^{2+}, it cleaves each DNA strand of dsDNA randomly and independently	Mononucleotides	Removing DNA from RNA preparations	37 °C	65 °C for 10 minutes[a]
RNase-Free DNase I	dsDNA and ssDNA	Activated by divalent cations. In presence of Mg^{2+}, it cleaves each DNA strand of dsDNA randomly and independently, preferentially adjacent to pyrimidines. In presence of Mn^{2+}, it cleaves both strands simultaneously, generating fragments with blunt ends or 1- to 2-base overhangs.	Oligos and dNMPs with 5′ P and 3′ OH	• Removing DNA from RNA preparations • Random nicking of dsDNA • DNase footprinting	37 °C	n.d.

[a] In the presence of the provided Stop Solution.
n.d., not determined.

DNA exonucleases

Enzyme	Substrate	Activity	Products	Applications	Optimum temp.	Heat inactivation
Exonuclease I (*E. coli*)	ssDNA	3′→ 5′ exonuclease that digests ssDNA in the presence of Mg^{2+}.	dNMPs	Removal of ssDNA and oligonucleotides.	37 °C	80 °C for 15 minutes
Exonuclease III (*E. coli*)	dsDNA	3′→ 5′ exonuclease that digests duplex DNA from the 3′ end of a nick, or a blunt or 3′-recessed end; not active on thionucleotides. Exo III also has RNase H, 3′-DNA phosphatase, and apurinic DNA endonuclease activities.	dNMPs and ssDNA on the opposite strand. Partial digestion produces dsDNA having 5′ extensions of ssDNA.	• Used with S1 Nuclease or Mung Bean Nuclease to make nested deletions • Preparation of ssDNA templates for sequencing • Site-directed mutagenesis • Preparation of labeled strand-specific probes	37 °C	65 °C for 10 minutes
Exonuclease VII	ssDNA	Exonuclease that digests ssDNA in both 5′→3′ and 3′→ 5′ directions.	dNMPs	Removal of primers and single-stranded oligos.	37 °C	n.d.
Plasmid-Safe ATP-Dependent DNase	linear ssDNA and dsDNA	Selectively digests linear DNA. No activity on nicked or closed-circular dsDNA.	dNMPs	Removal of chromosomal DNA fragments from plasmid, fosmid, and BAC preparations.	37 °C	70 °C for 30 minutes
Rec J Exonuclease	ssDNA	5′→ 3′ exonuclease that digests ssDNA in the presence of Mg^{2+}.	dNMPs	Removal of primers and ssDNA from dsDNA.	37 °C	65 °C for 20 minutes

Nucleases active on both DNA and RNA

Enzyme	Substrate	Activity	Products	Applications	Optimum temp.	Heat inactivation
Terminator 5′-Phosphate-Dependent Exonuclease	ssDNA or ssRNA	5′→3′ exonuclease that digests ssDNA or ssRNA with 5′-monophosphorylated ends, but not with 5′-OH, 5′-triphosphorylated, or 5′-capped ends	dNMPs or NMPs	• Removal of 5′-monophosphorylated DNA or primers or oligos • Enrichment of ssDNA or ssRNA molecules lacking 5′-monophosphate groups	30 °C (Buffer A) 42 °C (Buffer B)	not recommended
OmniCleave Endonuclease	ssDNA, dsDNA, or RNA	Endonuclease that efficiently digests DNA and RNA	di-, tri-, and tetra-nucleotides	• Removal of DNA and RNA from protein preparations • Removal of host DNA from phage preparations.	25–37 °C	not recommended

RNA nucleases

Enzyme	Substrate	Activity	Products	Applications	Optimum temp.	Heat inactivation
RNase A	ssRNA	Cleaves ssRNA 3′ of pyrimidine residues.	Oligoribonucleotides with 3′-cytidine or 3′-uridine residues	• Removal of RNA from DNA preparations • RNase protection assays • RNA mapping and structure studies	37 °C (15–70 °C)	not recommended
RNase I, *E. coli*	ssRNA	Cleaves ssRNA between all dinucleotide pairs.	NMPs with 5′-OH and 2′,3′-cyclic monophosphate	• Removal of RNA from DNA preparations • RNase protection assays • Mismatch detection of single basepairs in RNA:RNA or RNA:DNA hybrids	37 °C	70 °C for 20 minutes (in presence of 5 mM DTT)
Hybridase Thermostable RNase H	RNA in RNA:DNA hybrid	Cleaves RNA in RNA:DNA hybrid without affecting unhybridised RNA or DNA.	Oligoribonucleotides with 5′ phosphate and 3′ OH.	High-stringency hybrid selection.	45–70 °C	not recommended
RNase R	linear RNA	Digests linear RNA, including the ssRNA end of lariat structures, but not circular RNA or dsRNA with 3′ overhangs <7 nt.	Oligoribonucleotides with 5′ phosphate and 3′ OH	• Alternative splicing and gene expression studies • Intron cDNA production • Intronic screening of cDNA libraries	37 °C	n.d.

n.d., not determined.

Enzyme properties
Enzymes for molecular biology

Ligases

Name of ligase	Cofactor	Ligation template required to ligate	Type of ends ligated		Primary application	Optimum temp.	Heat inactivation
			Blunt	Cohesive			
NxGen T4 DNA Ligase	ATP	No[a]	Yes	Yes	Cloning	4–25 °C	70 °C for 15 minutes
Ampligase Thermostable DNA Ligase	NAD	Yes; DNA only	No	Yes	Template-dependent ligation	45–65 °C	not recommended
Fast-Link DNA Ligase	ATP	No[a]	Yes	Yes	Rapid cloning	16–25 °C	70 °C for 15 minutes
T4 RNA Ligase 2, Deletion Mutant	Not needed	No	Ligates ss adenylated DNA or RNA to small RNAs		Ligation of RNA to RNA	37 °C	n.d.
CircLigase ssDNA Ligase	ATP	No	Self-ligates (circularises) ssDNA or ssRNA with 5′ P and 3′ OH		Making ssDNA circles for rolling-circle replication, transcription, and small-RNA sequencing	60 °C	80 °C for 10 minutes
CircLigase II ssDNA Ligase	Not needed	No	Self-ligates (circularises) ssDNA or ssRNA with 5′ P and 3′ OH		Making ssDNA circles for rolling-circle replication, transcription, and small-RNA sequencing	60 °C	80 °C for 10 minutes

a. These enzymes ligate blunt ends of dsDNA, but ligation is more efficient with cohesive ends.
n.d., not determined.

Phosphatases and kinases

Enzyme	Substrate	Activity	Products	Applications	Optimum temp.	Heat inactivation
RNA 5′ Polyphosphatase	5′-di or tri-phosphorylated RNA	Removes γ and β phosphates	5′-monophosphorylated RNA	• Ligation-tagging • Analysis of 5′-end structure	37 °C	n.d.
T4 Polynucleotide Kinase, Cloned	DNA, RNA	Catalyses transfer of γ phosphate of ATP to 5′ terminus of DNA (ds/ss) or RNA (with 3′ OH)	Phosphorylated DNA, RNA	Addition of 5′ phosphate to DNA or RNA	37 °C	70 °C for 5 minutes

n.d., not determined.

RNA-guided endonucleases

Enzyme	Modifications	Concentration	PAM preference	Type of edit	Guide RNA length
CRISPRcraft S.p. Cas9 Nuclease	One C-terminal NLS, one C-terminal 6 × His tag	10 mg/mL (62 µM)	G-rich (NGG)	Blunt double-stranded break	~97 nt
AsCpf1 Nuclease	Two C-terminal NLS, one C-terminal 6 × His tag	10 mg/mL (64 µM)	T-rich (TTTV)	Staggered double-stranded break	~41 nt

NLS, nuclear localisation signal; PAM, protospacer-adjacent motif.

Bst DNA Polymerase, Exonuclease Minus

Bst DNA Polymerase, Exonuclease Minus,* is a recombinant form of the 67 kDa Bacillus stearothermophilus DNA Polymerase protein (large fragment). The enzyme has 5′→3′ polymerase activity and strand-displacement activity, but it lacks 3′→5′ exonuclease activity. It also has reverse transcription activity.

- Strand-displacement amplification
- DNA sequencing through high GC regions
- Rapid sequencing from nanogram amounts of DNA template

Cat. #	Concentration	Quantity
Bst DNA Polymerase, Exonuclease Minus		
30027-1	8,000 U/mL	2,000 U
30027-2	8,000 U/mL	10,000 U
30028-1	50,000 U/mL	10,000 U

Contents: Enzyme, 10 X DNA Polymerase Buffer B

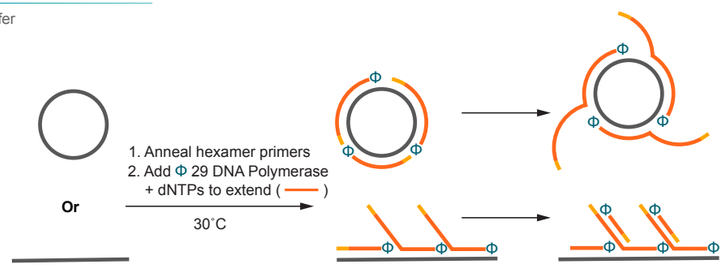
***Note:** Some uses for this product may require licenses. Lucigen does not encourage or support the unauthorised or unlicensed use of patented nucleic acid amplification processes for isothermal amplification, whole-genome amplification (WGA), multiple-displacement amplification (MDA), and next-generation sequencing. It is the sole responsibility of the buyer to ensure that use of the product does not infringe the patent rights of third parties. If the purchaser is not willing to accept these use limitations, Lucigen Corporation is willing to accept return of the product for a full refund.

NxGen phi29 DNA Polymerase

NxGen phi29 DNA Polymerase (φ29 DNA Polymerase) is a highly processive enzyme with exceptional strand-displacement activity. The enzyme also contains a 3′→5′ exonuclease activity that enables proofreading capability.

Cat. #	Concentration	Quantity
NxGen phi29 DNA Polymerase		
30221-1	10,000 U/mL	2,000 U
30221-2	10,000 U/mL	10,000 U

Contents: Enzyme, 10X phi29 DNA Polymerase Buffer



Activity of NxGen phi29 DNA Polymerase.

Exo-Minus Klenow DNA Polymerase (D355A, E357A)

Exo-Minus Klenow DNA Polymerase is a DNA-dependent DNA polymerase that lacks both the 5′→3′ and 3′→5′exonuclease activities of *E. coli* DNA Polymerase I, from which it is derived. This N-terminal truncation of DNA Polymerase I also has two mutations (D355A and E357A).

- Random-primer labeling of DNA
- Second-strand cDNA synthesis
- Strand-displacement amplification

Cat. #	Concentration	Quantity
Exo-Minus Klenow DNA Polymerase (D355A, E357A)		
KL11101K	10 U/µL	1,000 U

Contents: Enzyme, 10X Reaction Buffer

FailSafe Enzyme Mix

FailSafe Enzyme Mix is a unique blend of thermostable DNA polymerase and a 3′→5′ proofreading exonuclease that is capable of amplifying most difficult templates. The FailSafe enzyme provides 3-fold higher fidelity than *Taq* DNA polymerase, with the ability to amplify PCR products up to 20 kb. The error rate of the FailSafe Enzyme Mix is approximately 1 in 27,000–30,000.

- PCR and multiplex PCR
- PCR of difficult templates
- High-sensitivity PCR
- PCR amplification of any sequence up to 20 kb

Cat. #	Quantity
FailSafe Enzyme Mix Only	
FSE51100	100 U
FSE5101K	1,000 U

EconoTaq DNA Polymerase

Derived from *Thermus aquaticus*, this enzyme has optimal activity at temperatures above 70 °C. It has an intrinsic 5′→3′ structure-dependent exonuclease activity but lacks 3′→5′ proofreading exonuclease activity. EconoTaq's low price is coupled with high quality and performance. It is supplied with a magnesium-containing buffer or a separate tube of $MgCl_2$.

- PCR and multiplex PCR amplification of DNA templates

Cat. #	Concentration	Quantity
EconoTaq DNA Polymerase (with Mg^{2+})		
30031-1	5 U/µL	1,000 U
30031-2	5 U/µL	5,000 U
30031-3	5 U/µL	10,000 U
Contents: Enzyme, 10X Reaction Buffer with Mg^{2+}		
EconoTaq DNA Polymerase (separate Mg^{2+})		
30032-1	5 U/µL	1,000 U
30032-2	5 U/µL	5,000 U
30032-3	5 U/µL	10,000 U

Contents: Enzyme, 10X Reaction Buffer without Mg^{2+}, 25 mM MgCl2

MasterAmp Taq DNA Polymerase

Derived from *Thermus aquaticus*, this enzyme has optimal activity at temperatures above 70 °C. It has an intrinsic 5′→3′ structure-dependent exonuclease activity but lacks 3′→5′ proofreading exonuclease activity.

The enzyme is provided with the MasterAmp PCR Enhancer, which increases the probability of obtaining the desired amplification product and the reproducibility of PCR. It improves the consistency of PCR product yields in multiplex PCR.

- PCR and multiplex PCR amplification of DNA templates

Cat. #	Concentration	Quantity
MasterAmp Taq DNA Polymerase		
Q82500	5 U/µL	500 U
Q8201K	5 U/µL	1,000 U
Q8205K	5 U/µL	5,000 U

Contents: Enzyme, 10X PCR Buffer, 25 mM MgCl2, and MasterAmp 10X PCR Enhancer.

For optimal results, use with MasterAmp PCR PreMixes.

EconoTaq PLUS 2X Master Mix

EconoTaq PLUS 2X Master Mix is a ready-to-use PCR master mix, containing dNTPs and PCR Enhancer. It offers outstanding performance and value, and is perfect for routine PCR.

- PCR and multiplex PCR amplification of DNA templates

Cat. #	Quantity
EconoTaq PLUS 2X Master Mix	
30035-1	500 reactions
30035-2	1,000 reactions

Contents: Master Mix

MasterAmp *Tth* DNA Polymerase

This recombinant enzyme from Thermus thermophilus has DNA polymerase activities up to ~95 °C, as well as reverse-transcriptase activity. High reaction temperatures can reduce nonspecific priming and template secondary structure. It is provided with MasterAmp PCR Enhancer.

- PCR amplification of DNA
- Improved PCR of DNA templates having a high degree of secondary structure
- One-step RT-PCR of RNA

Cat. #	Concentration	Quantity
MasterAmp *Tth* DNA Polymerase		
TTH72250	5 U/µL	250 U

Contents: 20X PCR Buffer (without Mg^{2+} or Mn^{2+}) plus separate 25 mM solutions of $MgCl_2$ and $MnSO_4$, and MasterAmp 10X PCR Enhancer

For optimal results, use with MasterAmp PCR PreMixes.

NxGen T7 RNA Polymerase

T7 RNA Polymerase catalyses the 5′→3′ RNA synthesis from the T7 promoter. It is a DNA-dependent RNA polymerase cloned from the T7 bacteriophage. It recognises the T7 promoter and terminator sequences with high specificity.

- Synthesis of RNA for nucleic acid amplification methods or gene expression studies

Cat. #	Concentration	Quantity
NxGen T7 RNA Polymerase		
30223-1	50 U/µL	25,000 U
30223-2	50 U/µL	125,000 U

Contents: Enzyme, 10X T7 RNA Polymerase Buffer

Poly(A) Polymerase Tailing Kit

Poly(A) Polymerase uses ATP as a substrate for template-independent addition of adenosine monophosphate to the 3′-OH termini of RNA molecules. The Poly(A) Polymerase Tailing Kit provides the enzyme and other reagents for quickly and easily adding a poly(A) tail to the 3′ end of any RNA.

- Addition of a poly(A) tail to RNA synthesised *in vitro*
- Synthesis of polyadenylated RNA for nucleic acid amplification methods or gene expression studies
- 3′-end-labeling of RNA with radioactive A residues

Cat. #	Concentration	Quantity
Poly(A) Polymerase Tailing Kit		
PAP5104H	4 U/µL	50 Reactions

Contents: Poly(A) Polymerase, 10X Reaction Buffer, 10 mM ATP, Sterile RNase-Free Water

T7 R&DNA Polymerase

This enzyme is a mutant form of T7 RNA polymerase (Y639F mutant). The mutation enables T7 R&DNA Polymerase to incorporate 2′-deoxyribonucleoside triphosphates (dNTPs) into full-length “RNA” transcripts more efficiently than the corresponding wild-type T7 RNA polymerase.

This mutant enzyme uses the same T7 transcription promoters as the wild-type T7 RNA polymerase.

- Synthesis of “RNA” transcripts of mixed rNMP/2′-dNMP composition
- Synthesis of modified “RNA” transcripts that are resistant to RNase A

Cat. #	Concentration	Quantity
D7P9201K	50 U/µL	1,000 U
D7P9205K	50 U/µL	5,000 U

Contents: Enzyme, 5X Reaction Buffer, 100 mM DTT

MMLV High Performance Reverse Transcriptase

MMLV High Performance Reverse Transcriptase (MMLV HP RT) demonstrates significantly greater reverse transcriptase activity than other commercially available MMLV RT enzymes. Typically, just 100 units of MMLV HP RT are required for full-length cDNA synthesis compared to 200 units of MMLV RT enzymes from many other suppliers. The enzyme synthesises full-length cDNA from RNA templates longer than 15 kb, starting with picogram amounts
of RNA.

- cDNA synthesis from total RNA or poly(A)-enriched RNA for subsequent PCR, qPCR, or RNA-Seq library preparation

Cat. #	Concentration	Quantity
MMLV High Performance Reverse Transcriptase		
RT80125K	200 U/µL	25,000 U

Contents: Enzyme, 10X Reaction Buffer, DTT

EpiScript RNase H⁻ Reverse Transcriptase

EpiScript Reverse Transcriptase is highly efficient at producing full-length cDNA from RNA templates up to 12 kb. The enzyme is genetically engineered to substantially reduce RNase H activity. This structural modification eliminates degradation of RNA molecules during first-strand cDNA synthesis and gives EpiScript Reverse Transcriptase superior performance for real-time RT-PCR analysis and other applications.

- Efficient cDNA synthesis from picogram amounts of total RNA for subsequent PCR, qPCR, or RNA-Seq library preparation

Cat. #	Concentration	Quantity
EpiScript Reverse Transcriptase		
ERT12910K	200 U/µL	10,000 U
ERT12925K	200 U/µL	25,000 U

Contents: Enzyme, 10X Reaction Buffer, DTT

NxGen M-MuLV Reverse Transcriptase

NxGen M-MuLV Reverse Transcriptase is an RNA-dependent DNA polymerase that shows no measurable 3′→5′ proofreading activity. This enzyme can copy a single-stranded DNA template or perform cDNA synthesis by extending a DNA primer annealed to an RNA template.

- cDNA synthesis from total RNA or poly(A)-enriched RNA for subsequent PCR, qPCR, or RNA-Seq library preparation

Cat. #	Concentration	Quantity
NxGen M-MuLV Reverse Transcriptase		
30222-1	200 U/µL	50,000 U
30222-2	200 U/µL	250,000 U

Contents: Enzyme, 10X M-MuLV RT Buffer

Baseline-ZERO DNase

Baseline-ZERO DNase digests dsDNA and ssDNA to mononucleotides more effectively than the commonly used bovine pancreatic DNase I. Following treatment with Baseline-ZERO DNase, even the small DNA oligonucleotides that remain after treatment with DNase I are undetectable. The enzyme provides a true zero baseline for RNA RT-PCR or microarray gene expression experiments.

- Removal of genomic DNA from RNA before RT-PCR, or preparation of target RNA or cDNA for microarray analysis, especially for exon arrays or full-coverage expression analysis
- Removal of small DNA oligonucleotides (e.g., random primers)

Cat. #	Concentration	Quantity
Baseline-ZERO DNase		
DB0715K	1 U/µL	5,000 MBU

Contents: Enzyme, 10X Reaction Buffer, 10X Stop Solution

RNase-Free DNase I

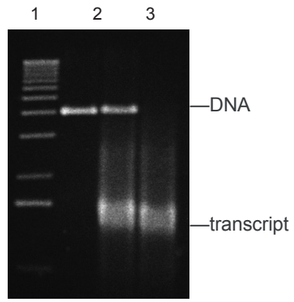
RNase-Free DNase I (bovine pancreas) is an endonuclease useful in removing DNA that might interfere with the characterisation, manipulation, or use of RNA, or for any application requiring highly purified DNase I, such as nick translation. This enzyme efficiently hydrolyses dsDNA and ssDNA to a mixture of short oligonucleotides and mononucleotides.

- Elimination of template DNA following *in vitro* synthesis of RNA with T7 phage RNA polymerase
- Labeling of DNA by nick translation, in combination with Klenow or other DNA polymerases
- Treatment of RNA before RT-PCR
- Characterisation of DNA-protein interactions by DNase I footprinting

Cat. #	Concentration	Quantity
RNase-Free DNase I		
D9905K	1 U/µL	5,000 MBU
D9910K	1 U/µL	10,000 MBU

Contents: Enzyme, 10X Reaction Buffer

DNA removal from *in vitro* transcription reactions using RNase-Free DNase I. A linearised DNA template was transcribed using T7 RNA polymerase according to standard *in vitro* transcription conditions. Lane 1, kb ladder; lane 2, DNA control; lane 3, transcription mixture; lane 4, transcription mixture treated with 1 MBU of RNase-Free DNase I for 15 minutes at 37 °C.



Exonuclease I, *E. coli*

Exonuclease I digests ssDNA in a 3′→ 5′ direction but does not digest dsDNA. Although it requires the presence of magnesium and a free 3′-OH terminus for activity, it is active under a wide variety of buffer conditions and can be added directly into most reaction mixes.

- Removal of residual ssDNA, including oligos, from reaction mixes
- Removal of ssDNA from nucleic acid mixtures

Cat. #	Concentration	Quantity
Exonuclease I, *E. coli*		
X40520K	20 U/µL	20,000 U

Contents: Enzyme only

Exonuclease VII

Exonuclease VII has high enzymatic specificity for ssDNA and exhibits both 5′→ 3′ and 3′→ 5′ exonuclease activities. It is useful for rapid removal of single-stranded oligonucleotide primers from a completed amplification reaction when different primers are required for subsequent PCR. Exonuclease VII digestion of ssDNA occurs in the absence of magnesium.

- Removal of single-stranded oligonucleotide primers after PCR
- Minimising the effect of primers left over from previous PCRs

Cat. #	Concentration	Quantity
Exonuclease VII		
EN510250	10 U/µL	250 U

Contents: Enzyme, 5X Reaction Buffer

Plasmid-Safe ATP-Dependent DNase

Plasmid-Safe ATP-Dependent DNase selectively removes contaminating bacterial chromosomal DNA from cosmid, BAC, fosmid, and plasmid preparations. The enzyme will processively degrade linear DNA from the ends; closed circular DNA (e.g., a plasmid) does not have free ends and is therefore not degraded. These properties make Plasmid-Safe ATP-Dependent DNase ideal for BAC and fosmid purification protocols, such as for shotgun sequencing, and other applications where high-purity DNA is necessary.

- Removal of contaminating bacterial chromosomal DNA in large-scale plasmid, cosmid, fosmid, and BAC vector or clone preparations

Cat. #	Concentration	Quantity
Plasmid-Safe ATP-Dependent DNase		
E3101K	10 U/µL	1,000 U
E3110K	10 U/µL	10,000 U

Contents: Enzyme, 10X Reaction Buffer, 25 mM ATP

Exonuclease III, *E. coli*

Exonuclease III digests duplex DNA in a 3′→ 5′ direction from a nick, a blunt end, or a 3′ recessed end, producing stretches of ssDNA on the opposite strand.

- Production of intermediates for site-directed mutagenesis
- Production of strand-specific radiolabeled probes

Cat. #	Concentration	Quantity
Exonuclease III, *E. coli*		
EX4425K	200 U/µL	25,000 U

Contents: Enzyme, 10X Reaction Buffer

Rec J Exonuclease

Rec J Exonuclease, derived from *E. coli*, catalyses removal of deoxyribonucleoside monophosphates from ssDNA in a 5′→3′ direction. Its activity is dependent on Mg^{2+}. Rec J Exonuclease can be heat-inactivated by incubation at 65 °C for 20 minutes.

- Removal of primers from completed PCRs
- Degradation of single-stranded linear DNA in dsDNA and plasmid preparations

Cat. #	Concentration	Quantity
Rec J Exonuclease		
RJ411250	10 U/µL	250 U

Contents: Enzyme, 10X Reaction Buffer

RNase A

RNase A is an endoribonuclease that cleaves ssRNA at the 3′ end of pyrimidine residues, forming oligoribonucleotides having 3′-terminal pyrimidine-3′-phosphates. Pyrimidine-3′-monophosphates are also released by RNase A cleavage of adjacent pyrimidine nucleotides. Modified RNA containing pyrimidine-2′-fluoro-dNMPs, such as modified RNA made by *in vitro* transcription using the DuraScribe® T7 Transcription Kit, is completely resistant to cleavage by RNase A.

- Removal of RNA from DNA preparations
- Removal of unhybridised regions of RNA from DNA-RNA or RNA-RNA hybrids

Cat. #	Concentration	Quantity
RNase A		
MRNA092	5 mg/mL	2 mL

Contents: Enzyme only

RNase R

RNase R is a 3′→ 5′ exoribonuclease that digests essentially all linear RNAs but will not digest lariat or circular RNA structures. Intron RNA can be isolated from total RNA samples by digestion with RNase R. After digestion, only circular RNAs remain.

- Alternative splicing studies
- Gene expression studies
- CircRNA-Seq library preparation
- Intronic screening of cDNA libraries

Cat. #	Concentration	Quantity
RNase R		
RNR07250	20 U/µL	250 U

Contents: Enzyme, 10X Reaction Buffer

RNase I, *E. coli*

RNase I degrades ssRNA to nucleoside-3′-monophosphates, via 2′,3′ cyclic monophosphate intermediates, by cleaving between all dinucleotide pairs. This enzyme is completely inactivated by heating at 70 °C for 15 minutes, eliminating the requirement to remove the enzyme before many downstream applications.

- Removal of RNA from DNA preparations
- RNase protection assays to detect single-basepair mismatches in RNA:RNA and RNA:DNA hybrids

Cat. #	Concentration	Quantity
RNase I, *E. coli*		
N6901K	10 U/µL	1,000 U

Contents: Enzyme, Dilution Buffer, 10X TNE Buffer, 0.1 M DTT

Hybridase Thermostable RNase H

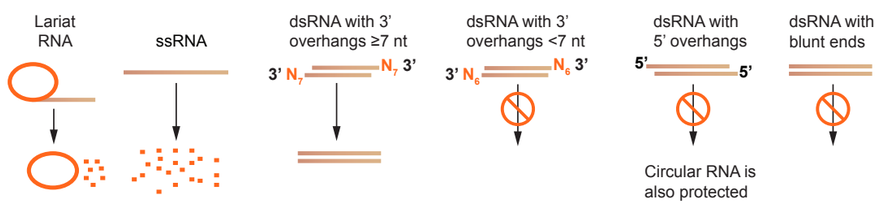
Hybridase Thermostable RNase H degrades the RNA in a DNA:RNA hybrid, without affecting DNA or unhybridised RNA. In contrast to *E. coli* RNase H, which is rapidly inactivated at 55 °C, this enzyme has optimal activity above 65 °C, and can be used up to 95 °C. This property allows it to be used at temperatures that give the highest hybridisation stringency for specific DNA:RNA heteroduplexes, maximising sensitivity and selectivity while minimising background due to nonspecific hybridisation.

- High-stringency hybrid selection
- Diagnostic assays of target DNA sequences
- Transcription-based amplification methods
- High-stringency mapping of mRNA structure

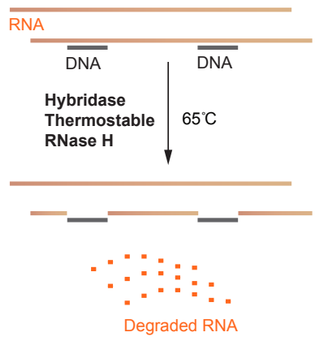
Cat. #	Concentration	Quantity
Hybridase Thermostable RNase H		
H39500	5 U/µL	500 U

Contents: Enzyme only

Activity of RNase R enzyme.



Activity of Hybridase Thermostable RNase H enzyme.



Terminator 5′-Phosphate-Dependent Exonuclease

Terminator Exonuclease is a 5′→ 3′, processive exonuclease that degrades RNAs with a 5′ monophosphate. It does not degrade RNAs with a 5′ triphosphate, 5′-cap structure (such as found on most eukaryotic mRNAs), or a 5′ OH. It will also digest DNA with a 5′ monophosphate. The enzyme is not inhibited by proteinaceous RNase inhibitors.

- Characterising the 5′ termini of RNA transcripts
- Preparing mRNA-enriched samples from eukaryotic or prokaryotic total RNA preparations in 1 hour without the use of oligo(dT), resins, or magnetic beads

Cat. #	Concentration	Quantity
Terminator 5′-Phosphate-Dependent Exonuclease		
TER51020	1 U/µL	40 U

Contents: Enzyme, 10X Reaction Buffers A and B

OmniCleave Endonuclease

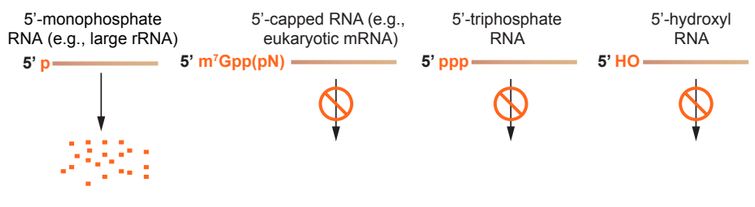
This endonuclease digests all forms of DNA and RNA including single-stranded and double-stranded linear, circular, and supercoiled. OmniCleave Endonuclease has the same substrate specificity, and yields the same products as Benzonase®, an enzyme derived from *Serratia marcescens*.

- Removal of nucleic acids from cell lysates (reduction of viscosity) for improved handling and yield of protein preparations
- Removal of trace contamination by nucleic acids in protein preparations
- Removal of host DNA from phage preparations

Cat. #	Concentration	Quantity
OmniCleave Endonuclease		
OC7850K	200 U/µL	50,000 U

Contents: Enzyme, Dilution Buffer

Activity of Terminator 5′-Phosphate-Dependent Exonuclease.



Ready-Lyse Lysozyme Solution

Ready-Lyse Lysozyme Solution is a nonmammalian, nonavian, recombinant lysozyme preparation for the lysis of Gram-negative (e.g., *E. coli*) and Gram-positive (e.g., *Bacillus sp*.) bacteria. The specific activity of Ready-Lyse Lysozyme is 200-fold higher than that of egg-white lysozyme. Additionally, it is stable at –20 °C, eliminating the need to prepare a fresh solution for each use. The use of Ready-Lyse Lysozyme results in higher yields of protein or nucleic acids than can be obtained with standard egg-white lysozyme.

- Lysis of Gram-negative or Gram-positive bacteria for protein purification
- Preparation of nucleic acids from bacteria

Cat. #	Quantity
Ready-Lyse Lysozyme Solution	
R1804M	4×10^6 U
R1810M	10×10^6 U

Contents: Enzyme only

Use of Ready-Lyse Lysozyme Solution to recover recombinant proteins. A 1 mL sample of induced cells from a recombinant *E. coli* clone was pelleted by microcentrifugation before induction and at 1 and 3 hours after induction. Ready-Lyse Solution (1 mL) was added to each suspension and cells were incubated at room temperature for 30 minutes. The induced protein is designated by an arrow.

NxGen T4 DNA Ligase

NxGen T4 DNA Ligase is a ATP-dependent ligase commonly used for DNA cloning. It covalently joins dsDNA molecules having 5′-phosphorylated and 3′-hydroxylated blunt or compatible cohesive ends produced by restriction enzyme digestion or other enzymatic processes. It has no activity on single-stranded nucleic acids.

- Ligation of blunt or cohesive-ended DNA fragments
- Repair of nicks in double-stranded nucleic acids

Cat. #	Concentration	Quantity
NxGen T4 DNA Ligase (Low Concentration)		
30241-1	2 U/µL*	1,500 U
30241-2	2 U/µL*	7,500 U
Contents: Enzyme, 10X T4 DNA Ligase Buffer		
NxGen T4 DNA Ligase (High Concentration)		
30243-1	10 U/µL*	1,500 U
30243-2	10 U/µL*	7,500 U

Contents: Enzyme, 10X T4 DNA Ligase Buffer, 2X Rapid Ligation Buffer
*Weiss units

Fast-Link DNA Ligation Kit

Fast-Link T4 DNA Ligase provides extremely rapid, high-efficiency DNA ligation. Cohesive-end ligations can be performed in 5 minutes at room temperature. In contrast to other ligases, it is not necessary to desalt Fast-Link ligation reactions prior to transformation of electrocompetent or chemically competent cells.

- Blunt-end and TA cloning of PCR products
- Ligation of next gen sequencing adapters to blunt-end DNA
- Genomic and cDNA cloning and subcloning
- BAC/fosmid library construction
- Linker ligation

Cat. #	Quantity
Fast-Link DNA Ligation Kit	
LK0705H	50 Ligations
LK6201H	100 Ligations

Contents: Enzyme, Fast-Link 10X Ligation Buffer, 10 mM ATP

Ampligase Thermostable DNA Ligase

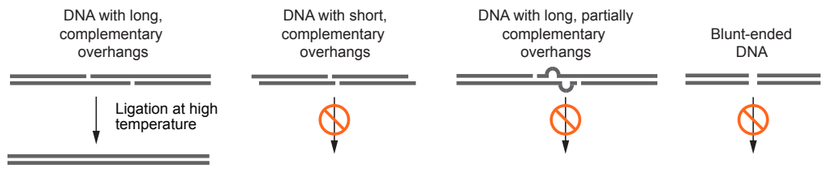
Derived from a thermophilic bacterium, Ampligase Thermostable DNA Ligase is stable and active at much higher temperatures than conventional DNA ligases. This enzyme catalyses NAD-dependent ligation of adjacent 3′-hydroxylated and 5′-phosphorylated termini in duplex DNA structures that are stable at high temperatures. Its half-life is 48 hours at 65 °C and >1 hour at 95 °C. It is active for at least 500 thermal cycles (94 °C/80 °C) or 16 hours of cycling, which permits extremely high hybridisation stringency and ligation specificity. It has no detectable activity in ligating blunt-ended DNA, RNA, or RNA:DNA hybrids.

- Sensitive detection of single-nucleotide polymorphisms (SNPs)
- Ligation amplification (ligase chain reaction, LCR)
- Gibson Assembly cloning
- Repeat expansion detection (RED)
- Simultaneous mutagenesis of multiple sites

Cat. #	Concentration	Quantity
Ampligase DNA Ligase Kit		
A8101	5 U/µL	1,000 U
Contents: Enzyme, 10X Reaction Buffer, Control DNA		
Ampligase Enzyme and Buffer		
A32750	5 U/µL	750 U
A3202K	5 U/µL	2,500 U
A0102K	100 U/µL	2,500 U
Contents: Enzyme, 10X Reaction Buffer		
Ampligase DNA Ligase		
A3210K	5 U/µL	10,000 U
A0110K	100 U/µL	10,000 U
Contents: Enzyme only		
Ampligase 10X Reaction Buffer		
A1905B	10X	5 mL

Note: One unit of Ampligase DNA Ligase is equal to as many as 15 units of other thermostable DNA ligases.

Activity of Ampligase Thermostable DNA Ligase.



T4 RNA Ligase 2, Deletion Mutant

T4 RNA Ligase 2, Deletion Mutant, T4Rnl2(1-249), ligates single-stranded, adenylated DNA or RNA (App-DNA or App-RNA) oligonucleotides to small RNAs. The preadenylated 5′ ends of DNA or RNA are ligated to the 3′ ends of RNA in the absence of ATP, which prevents circularisation and other undesirable bimolecular reactions.

- Preparation of cDNA libraries for small-RNA transcriptome analysis, such as RNA-Seq
- Optimal linker ligation for miRNA cloning

Cat. #	Concentration	Quantity
T4 RNA Ligase 2, Deletion Mutant		
LR2D1132K	200 U/µL	2,000 U
LR2D11310K	200 U/µL	10,000 U

Contents: Enzyme, 10X Reaction Buffer

CircLigase II ssDNA Ligase

This thermostable ligase catalyses intramolecular ligation (i.e., circularisation) of ssDNA templates >30 nt having a 5′ phosphate and a 3′ hydroxyl group. It ligates the ends of ssDNA in the absence of a complementary sequence. Standard reaction conditions produce no detectable single-stranded DNA concatamers or concatameric DNA circles. Due to the high degree of adenylation, a single CircLigase II enzyme can ligate only a single molecule of nonadenylated DNA, and the reaction stops in the absence of ATP. Therefore, a 1:1 stoichiometric amount of ligase:substrate is required to drive the ligation reaction to completion.

- Production of ssDNA templates for rolling-circle replication or rolling-circle transcription experiments
- Production of ssDNA templates for RNA polymerase and RNA polymerase inhibitor assays

Cat. #	Quantity
CircLigase II ssDNA Ligase	
CL9021K	1,000 U
CL9025K	5,000 U

Contents: Enzyme, CircLigase II 10X Reaction Buffer, 50 mM $MnCl_2$, CircLigase ssDNA Control Oligo, Betaine, Sterile Water

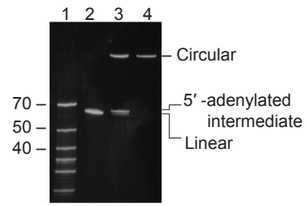
CircLigase ssDNA Ligase

This thermostable, ATP-dependent ligase catalyses intramolecular ligation (i.e., circularisation) of ssDNA templates >30 nt having a 5′ phosphate and a 3′ hydroxyl group. It ligates the ends of ssDNA in the absence of a complementary sequence. Standard reaction conditions produce no detectable single-stranded DNA concatamers or concatameric DNA circles. Due to the low degree of adenylation, CircLigase enzyme has high turnover; it can reversibly and repeatedly act on multiple preadenylated DNA molecules under nonstoichiometric reaction conditions.

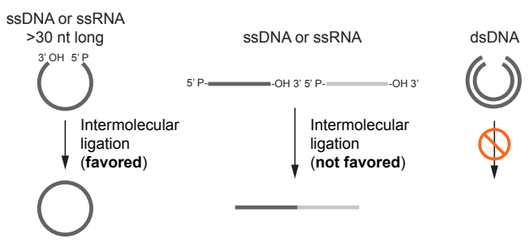
- Production of ssDNA templates for rolling-circle replication or rolling-circle transcription experiments
- Production of ssDNA templates for RNA polymerase and RNA polymerase inhibitor assays

Cat. #	Concentration	Quantity
CircLigase ssDNA Ligase		
CL4111K	100 U/µL	1,000 U
CL4115K	100 U/µL	5,000 U

Contents: Enzyme, CircLigase 10X Reaction Buffer, 1 mM ATP, 50 mM $MnCl_2$, CircLigase ssDNA Control Oligo, Sterile Water



CircLigase ssDNA Ligase converts linear ssDNA to circular ssDNA. A 71-base ssDNA oligo was converted to a circular DNA form in a reaction containing CircLigase ssDNA Ligase and ATP. Lane M, DNA markers. Lane 1, 71-base ssDNA. Lane 2, circularisation proceeds through an adenylated intermediate. Lane 3, the closed circular nature of the reaction product was confirmed by treating the reaction with Exonuclease I, which specifically digests linear DNA.



Activity of CircLigase ssDNA Ligase.

RNA 5′ Polyphosphatase

RNA 5′ Polyphosphatase is a Mg^{2+}-independent phosphohydrolase enzyme. It sequentially removes the γ and β phosphates from 5′- triphosphorylated RNA (such as primary RNA transcripts): However, it will not dephosphorylate monophosphorylated or 5′-capped RNA.

5′ pppN—OH 3′ → 5′ pN—OH 3′ + 2 P_i

- Conversion of 5′-triphosphorylated RNA to 5′-monophosphorylated RNA for use in 5′-RNA ligation-tagging methods using T4 RNA Ligase
- Analysis of 5′-end structures of RNA
- Preparation of substrate RNA molecules for subsequent degradation using Terminator Exonuclease

Cat. #	Concentration	Quantity
RNA 5′ Polyphosphatase		
RP8092H	20 U/µL	200 U

Contents: Enzyme, 10X Reaction Buffer

End-It DNA End-Repair Kit

The End-It DNA End-Repair Kit is used to convert DNA with damaged or incompatible 5′-protruding and/or 3′-protruding ends to 5′-phosphorylated, blunt-end DNA for the subsequent addition of next gen DNA sequencing adapters, or for cloning. After treatment of DNA with the End-It Kit, fast and efficient blunt-end ligation can be performed using the Fast-Link DNA Ligation Kit (Lucigen).

- Treatment of enzymatically or mechanically sheared DNA or cDNA before adding next gen sequencing adapters
- Polishing of enzymatically or mechanically sheared DNA, cDNA, or PCR amplicons with A overhangs, before cloning into plasmid, cosmid, fosmid, or BAC vectors.

Cat. #	Quantity
End-It DNA End-Repair Kit	
ER0720	20 Reactions
ER81050	50 Reactions

Contents: End-Repair Enzyme Mix, End-Repair 10X Buffer, dNTP Solution, ATP

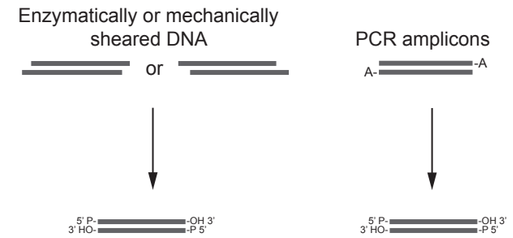
T4 Polynucleotide Kinase, Cloned

T4 Polynucleotide Kinase (PNK) catalyses the transfer of the γ phosphate from ATP to the 5′ OH of ssDNA and dsDNA, RNA, and nucleoside 3′-monophosphates. The enzyme also removes the 3′ phosphate from 3′-phosphoryl polynucleotides, deoxyribonucleoside 3′-monophosphates, and deoxyribonucleoside 3′,5′-diphosphates to form a 3′-OH group.

- Labeling of 5′ termini of DNA and RNA for DNA sequencing, blot-hybridisation, or transcript mapping
- Phosphorylation of oligonucleotide linkers and other DNA or RNA molecules before ligation, or for use in ligation amplification with Ampligase Thermostable DNA Ligase
- Preparation of labeled DNA or RNA molecular weight markers for gel electrophoresis and chromatography

Cat. #	Concentration	Quantity
T4 Polynucleotide Kinase, Cloned (PNK)		
P0503K	10 U/µL	3,000 U

Contents: Enzyme, 10X Reaction Buffer without ATP. ATP is available separately.



Activity of the End-It DNA End-Repair Kit.

CRISPRcraft S.p. Cas9 Nuclease

CRISPRcraft S.p. Cas9 Nuclease* is a purified, recombinant wild-type *Streptococcus pyogenes* Cas9 nuclease produced in *E. coli*, containing a C-terminal 6x His tag and a C-terminal nuclear localisation sequence (NLS) to allow efficient transport to the nucleus. It is provided at high concentration (10 mg/mL, 62 µM) to enable efficient ribonucleoprotein (RNP) delivery and compatibility with multiple delivery methods, including lipid-based transfection and electroporation.

- CRISPR/Cas9 gene-editing experiments
- Sequence-specific, RNA-guided cleavage of dsDNA
- Sequence enrichment and depletion

Cat. #	Concentration	Quantity
CRISPRcraft S.p. Cas9 Nuclease		
70020-1	10 mg/mL	120 µg
70020-2	200 U/µL	400 µg
Contents: Enzyme only		
CRISPRcraft S.p. Cas9 Nuclease Control Kit		
70020-1	10 mg/mL	120 µg
Contents: Cas9 Control HPRT Guide crRNA and Cas9 Universal tracrRNA, Human HPRT Forward and Reverse PCR Primers, Control HPRT Substrate DNA, 10X RGEN Buffer (Cas9 Nuclease not included)		

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AsCpf1 Nuclease

Cpf1 nuclease is an RNA-guided endonuclease (RGEN), with published applications including gene editing, sensitive DNA sequence detection, and cloning and assembling large DNA inserts. Several features distinguish Cpf1 from other RGEN enzymes. Cpf1 prefers an A/T-rich protospacer adjacent motif (PAM) sequence, enabling targeting of DNA sequences with high A/T content. Cpf1 cleaves DNA in a staggered fashion, similar to restriction enzymes. It does not require a tracrRNA, so guide RNAs are short.

AsCpf1 Nuclease* is a purified, recombinant *Acidaminococcus* sp. Cpf1 nuclease produced in *E. coli* with two C-terminal nuclear localisation sequences (NLS) and one C-terminal 6 × His tag.

Published applications include:

- CRISPR/Cpf1 gene-editing experiments
- Sequence-specific, RNA-guided cleavage of dsDNA
- Sequence enrichment and depletion
- DNA sequence detection

Cat. #	Concentration	Quantity
AsCpf1 Nuclease		
Available in bulk quantities with custom dispensing options. Please enquire: ***bizdev@lucigen.com***		

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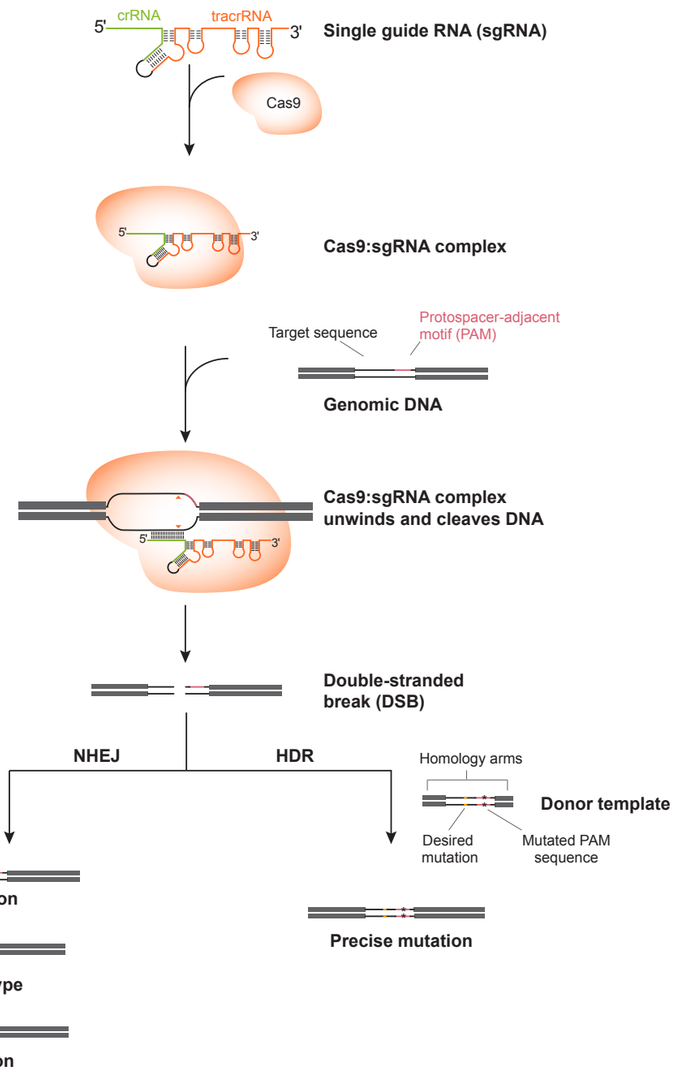
RNA-guided endonucleases
Enzymes for molecular biology



Schematic overview of the CRISPR-Cas9 genome-editing system. The CRISPR RNA (crRNA) and transactivating CRISPR RNA (tracrRNA) sequences may be provided as two complexed RNA molecules (dual guide RNA), or combined into a single guide RNA (sgRNA) as shown in this figure. The Cas9-sgRNA complex targets a DNA sequence, provided it contains a protospacer-adjacent motif (PAM) directly adjacent to the complementary crRNA sequence. The complex partially unwinds the DNA and interrogates the surrounding sequence for complementarity to the crRNA. If a match is found, the target sequence is cleaved, forming a double-stranded break (DSB).

The DSB is then repaired by one of two pathways. The nonhomologous end-joining (NHEJ) pathway results in insertions or deletions in the target genomic DNA, while the homology-directed repair (HDR) pathway produces a precise mutation. The donor template for HDR contains a mutation in the PAM sequence to avoid further cleavage of the newly created DNA by the Cas9:sgRNA complexes.

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