invitrogen
by Thermo Fisher Scientific

Competent *E. coli*

Discover a star-studded cast of competent cells: for all your transformation needs

You can depend on Invitrogen's competent *E. coli* to be:

- Reliable
- Efficient
- Innovative

Find it at **eu.fishersci.com**

fisher scientific
part of **Thermo Fisher Scientific**

Quick Reference Guide

Routine cloning

High-efficiency cloning

High-throughput cloning

Protein expression

Cloning unstable DNA

Single-stranded DNA production

Propagating unmethylated DNA

Gateway™ Technology

Recombinant baculo-virus production

Everything you've always wanted in competent cells

Since the introduction of commercially available competent cells, Invitrogen has continued to lead the way in competent cell technology, pushing forward the frontiers of transformation efficiency and strain development. With the highest efficiencies—ranging from >1 x 10^6 to >1 x 10^{10} cfu/µg pUC19—and the widest selection available, you're sure to find the right competent cell for your cloning and protein expression experiments.

Overview

Description Page

Symbol Legend

T1 Phage-Resistant


Electrocompetent

Consider the elements

Transformation efficiency. Genetic markers. The most important considerations when choosing the best competent cell for your cloning experiment.

Transformation efficiency

Invitrogen offers a wide range of transformation efficien-cies—ranging from >1 x 10^6 to >1 x 10^{10} cfu/µg—for every application.

ElectroMAX™ competent cells, the most efficient *E. coli* cells available, are designed for electroporation: ElectroMAX™ cells are provided at >1 x 10^{10} cfu/µg and are optimal for library construction or for cloning limiting amounts of DNA.

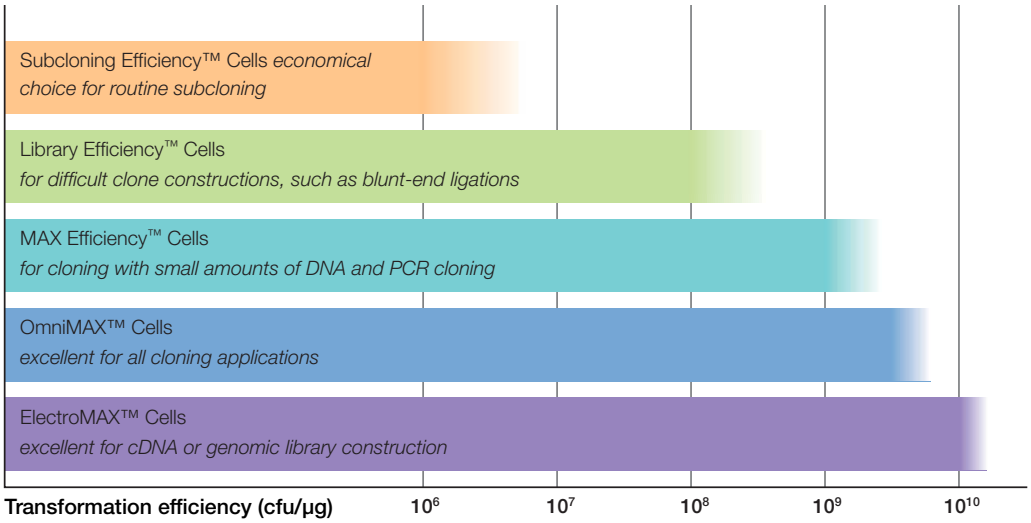
Chemically competent cells are available with efficiencies ranging from >1 x 10^6 to >5 x 10^9 cfu/µg. The efficiency chosen should reflect the difficulty of your cloning experiment.

Helpful hints

How do you determine efficiency?

Usually the transformation efficiency of competent cells is measured by transforming sub-saturating amounts of supercoiled pUC DNA (~10 to 500 pg). The results are expressed in number of transformants (or colony forming units) per µg of plasmid DNA (cfu/µg).

Table 1 - Efficiencies of Invitrogen *E. coli* host strains

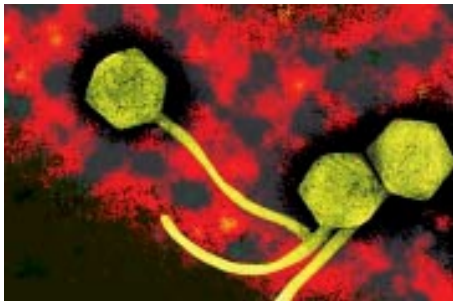


One Shot™ cells are generally provided at >1 x 10^9 or >1 x 10^8 cfu/µg.

Genetic markers for cloning

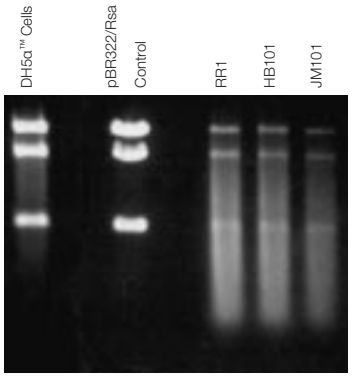
Genetic markers determine the applications a strain can be used for. They generally constitute host genes that have been mutated from wild-type, which allows for easy manipulation. Some of the most important genetic markers are:

*ton*A Protect your clones!
*ton*A mutation prevents T1 and T5 phage infection and safeguards your clones.



Colored representation of T1 bacteriophage.

*end*A1 Endonuclease I deficient. Ensures good quality mini-prep DNA.



DH5α™ cells are *end*A1 resulting in good quality mini-preps. Strains such as HB101, JM101, and RR1 are *end*A+ making them unsuitable for mini-prep analysis.

*rec*A1 General recombination deficient. Ensures insert stability and helps prevent unwanted recombination between insert and host. Inserts are more stable in *rec*A1 than in *rec*A13 hosts.

*lac*ZΔM15 Partial deletion of *lac*Z gene that allows for α-complementation. Required for blue/white color selection when *E. coli* is plated on X-gal containing agar.

Blue/white color selection can be used as a selection method for identify-ing positive clones (white) from non-recombinants (blue).

*lac*I^{q} Hosts carrying this marker overproduce the *lac* repressor, which negatively regulates transcription from the *lac* promoter. Repression is overcome by adding IPTG.

*mcr*A, *mcr*BC, and *mrr*
Mutations in these genes allow for the efficient cloning of methylated genomic DNA or methylated cDNA. Strains with these markers don't restrict foreign DNA, resulting in better-represented libraries.

F´ episome
Needed for ssDNA production. Codes for strand-like structures called pili, which are found on the outer membrane of *E. coli*. M13 phage infect *E. coli* through pili.

High-efficiency cloning, and subcloning *continued*

Post-transformation recovery medium

One Shot™ MAX Efficiency™ DH5α™-T1^R and DH10B™-T1^R cells

Cat. Nos. (see listing in back)

Type: Chemically competent
Efficiency: >1 x 10^9 cfu/µg
Size: 20 x 50µL (50µL per reaction)

Available in the single-use, 50µL One Shot™ format for ultimate convenience, DH5α™-T1^R and DH10B™-T1^R cells have the benefit of the *ton*A genotype for T1 and T5 phage resistance, with the same genetic markers, growth properties and transformation efficiency as the original strains. Use these cells for the reliable performance of the original strains with the added protection of T1 and T5 phage resistance.

Genotypes:
DH5α™-T1^R: F$^-$ ϕ80*lac*ZΔM15 Δ(*lac*ZYA-*arg*F) U169 *deo*R *rec*A1 *end*A1 *hsd*R17 (r_k^-, m_k^+) *pho*A *sup*E44 λ$^-$ *thi*-1 *gyr*A96 *rel*A1 *ton*A

DH10B™-T1^R: F$^-$ *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) ϕ80*lac*ZΔM15 Δ*lac*X74 *deo*R *rec*A1 *end*A1 *ara*Δ139 Δ(*ara, leu*)7697 *gal*U *gal*K λ$^-$ *rps*L(Str^R) *nup*G *ton*A

One Shot™ TOP10 cells10

Cat. No. 10666493

Type: Chemically competent
Efficiency: >1 x 10^9 cfu/µg
Size: 20 x 50µL (50µL per reaction)

The TOP10 cell strain is genetically similar to the reliable DH10B™ *E. coli* with the added convenience of a single-use One Shot™ format. This strain is a versatile cloning strain found in many TOPO™ Cloning and Expression Kits.

Genotype: F$^-$ *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) ϕ80*lac*ZΔM15 Δ*lac*X74 *deo*R *rec*A1 *end*A1 *ara*Δ139 Δ(*ara, leu*)7697 *gal*U *gal*K λ$^-$ *rps*L(Str^R) *nup*G

DH5α™ cells

Cat. Nos. (see listing in back)

Type: Chemically competent

DH5α™ *E. coli* is the most commonly used strain in the world, especially for general cloning procedures, and is provided in varying transformation efficiencies and packaging formats. This frequently cited strain is trusted by many researchers for their

High-efficiency cloning using electroporation

ElectroMAX™ DH10B™ T1 Phage-Resistant cells **Cat. No. 12007519**

Efficiency: >1 x 10^{10} cfu/µg
Size: 5 x 100µL (20µL per reaction)

ElectroMAX™ DH10B™-T1^{R} competent *E. coli* is the highest efficiency electrocompetent cell available. Derived from the widely used ElectroMAX™ DH10B™ strain, it includes the *ton*A genotype which prevents T1 infection and safeguards your valuable clones and libraries.

Genotype: F^{-} *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) ϕ80*lac*ZΔM15 Δ*lac*X74 *deo*R *rec*A1 *end*A1 *ara*Δ139 Δ(*ara, leu*)7697 *gal*U *gal*K λ^{-} *rps*L(Str^{R}) *nup*G *ton*A

ElectroMAX™ Stbl4™ cells **Cat. No. 11518656**

Efficiency: >5 x 10^{9} cfu/µg
Size: 5 x 100µL (25µL per reaction)

Rely on ElectroMAX™ Stbl4™ cells for high-efficiency cloning of unstable DNA, including repetitive DNA and retroviral sequences when you're performing genomic and cDNA library construction. These sequences are often unstable even in a *rec*A-deficient host. When making a library from DNA that is known to contain unstable sequences, ElectroMAX™ Stbl4™ cells offer you the best chance of getting full representation.

Genotype: *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) *rec*A1 *end*A1 *gyr*A96 *gal*$^{-}$ *thi*-1 *sup*E44 λ^{-} *rel*A1 Δ(*lac-pro*AB)/F′ *pro*AB^{+} *lacI*^{q} *lac*ZΔM15 Tn*10* (Tet^{R})

Helpful hints for blue/white screening

- Use pUC or pUC-based vectors that contain the portion of the *lac*Z gene that allows for α complementation
- Select an *E. coli* strain that carries the *lac*ZΔM15 marker
- Plate transformations on plates containing X-gal. Spread 50µg of 2% X-gal or 100µL of 2% Bluo-gal (both can be dissolved in dimethyl formamide or 50:50 DMSO:water) on the surface of a 100-mm plate and let dry. Alternatively, add directly to cooled medium (~50°C) before pouring the plates at a final concentration of 50µg/mL for X-gal and 300 µg/ml for Bluo-gal. Plates are stable for four weeks at 4°C
- If the strain used carries the lacIq marker, add IPTG to induce the *lac* promoter. Spread 30 µl of 100 mM IPTG (in water) on mm plates. Alternatively, add the IPTG directly to cooled medium (~50°C) before pouring the plates to a final concentration of 1 mM. Plates are stable for four weeks at 4°C
- Do not plate *E. coli* on medium containing glucose if using X-gal or Bluo-gal for blue-white screening. Glucose competes as a substrate and prevents cells from turning blue

High-throughput cloning

MultiShot™ StripWell Mach1™ T1 Phage-Resistant cells — Cat. No. 10032732

Type: Chemically competent
Efficiency: >1 x 10^9 cfu/µg
Size: 96 x 50µL (50µL per reaction)

The MultiShot™ StripWell OmniMAX™-T1^R competent cell format is designed for fast growth in a high-efficiency high-throughput format. The Mach1™-T1^R *E. coli* strain is the fastest growing chemically competent strain currently available. Mach1™-T1^R colonies are clearly visible within eight hours of plating the transformation mix (ampicillin selection only), enabling you to plate and pick colonies in the same day. From an overnight colony, mini-preps can be performed after only four hours of growth, saving a day of your research time. Mach1™-T1^R cells also benefit from T1 Phage resistance to protect against phage infection.

Genotype: F$^-$ϕ80*lac*ZΔM15 Δ*lac*X74 *hsd*R(r_k^-, m_k^+) Δ*rec*A1398 *end*A1 *ton*A

Protein expression

E. coli is one of the most popular hosts for overexpression of recombinant proteins (Table 2), because it grows fast, is inexpensive to use, and yields high levels of protein. The most popular strains for recombinant protein expression from T7 expression systems are BL21 and its derivatives. These strains are descended from the *E. coli* B strain and have been specifically constructed for high-level expression of recombinant proteins. BL21 strains have two important attributes that make them great for protein expression: key genetic markers (Table 3) and inducibility of protein expression. The most important genetic markers help recombinant RNA and/or protein accumulate to high levels without degradation. Protein expression in Invitrogen's BL21 strains can be induced with IPTG or L-arabinose. This inducibility helps to minimize the toxic effects of some recombinant proteins. L-arabinose induction (in the BL21-AI™ strain) may also aid in optimizing solubility as its induction is titratable.

Table 2 - Protein expression competent cells

Product	Cat. No.	Efficiency (cfu/µg)	Application	Expression vector
BL21-AI™ One Shot™ cells	11540146	>1 x 10^8	Tight regulation and strong expression of toxic proteins	Any 17 promoter-containg expression vector
BL21 Star™ (DE3) One Shot™ cells	10328512	>1 x 10^8	Extremely high expression of non-toxic patterns	Any 17 promoter-containg expression vector
Max Efficiency™ DH5αF′ IQ™ cells	11593117	>1 x 10^8	Expression from non-BL21 strains	Any lac or trc promoter-containing expression vector

Genetic markers

Table 3 - Genetic markers

Genetic Markers	
lon	Mutation in gene coding for Lon protease. Helps prevent recombinant protein degradation
ompT	Mutation in gene coding for OmpT outer membrane protease. Helps prevent recombinant protein degradation
*rne*131	Mutation in this gene causes production of defective RNaseE. This helps prevent mRNA degradation, a common cause of low recombinant protein expression levels. Found only in BL21 Star™ *E. coli*

Extremely high expression of non-toxic recombinant proteins

BL21 Star™(DE3) One Shot® cells **Cat. No. 10328512**

Type: Chemically competent
Efficiency: >1 x 10^8 cfu/µg
Size: 20 x 50µL (50µL per reaction)

BL21 Star™ *E. coli* is a unique strain designed for high-level recombinant protein expression. BL21 Star™ cells offer enhanced mRNA stability so that abundant mRNA is available for protein production (Figures 3B and 4A). This enhanced stability is due to a mutation in the RNaseE gene which codes for a key component of the degradosome responsible for RNA degradation. As shown in Figures 3 and 4, with BL21 Star™ *E. coli*, proteins were expressed at a two- to ten-fold higher level when compared with standard BL21. Use BL21 Star™ *E. coli* with any T7 promoter-containing bacterial expression vector.

Genotype: F⁻ *ompT hsdS*$_B$(r_B- m_B-) *gal dcm rne*131 (DE3)

Figure 3 - How BL21 Star™ *E. coli* improves mRNA stability

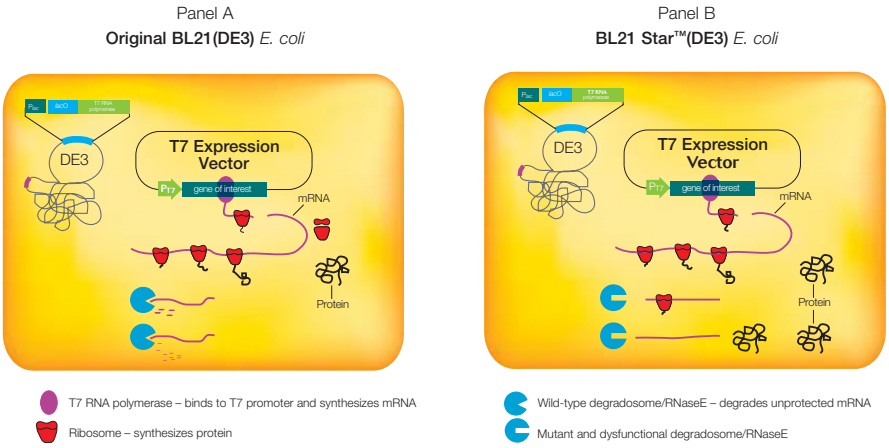
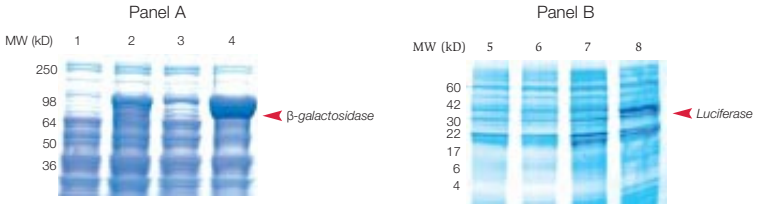


Figure 4 – BL21 Star™ cells demonstrate superior protein expression



pCR™T7/CT/*lacZ* (Panel A) and pET28/luciferase (Panel B) were transformed into BL21(DE3)pLysS and BL21 Star™(DE3)pLysS *E. coli.* A single colony from each transformation was used to inoculate 20 ml LB medium supplemented with 100 µg/mlL ampicillin. Induction with IPTG was performed at OD_{600}=0.5. Two and one-half hours post-induction, cultures were harvested by centrifugation. Pellets from 1.5 ml of each culture were resuspended in 400µL of NuPAGE™ protein sample buffer. Ten microliters of each sample was loaded for SDS-PAGE analysis.

Lanes 1 and 5: Uninduced BL21(DE3)pLysS
Lanes 2 and 6: Induced BL21(DE3)pLysS
Lanes 3 and 7: Uninduced BL21 Star™(DE3)pLysS
Lanes 4 and 8: Induced BL21 Star™(DE3)pLysS

High expression of toxic proteins

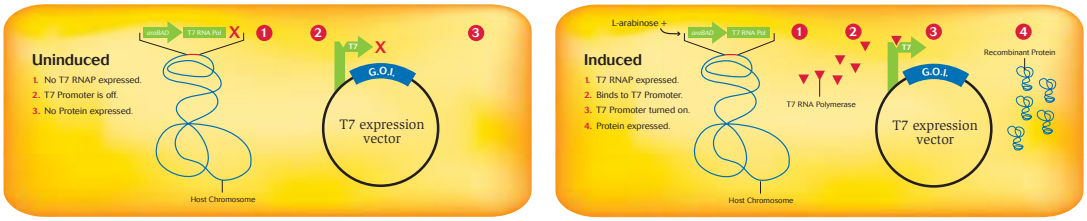
BL21-AI™ One Shot™ cells **Cat. No. 11540146**

Type: Chemically competent
Efficiency: >1 x 10^8 cfu/µg
Size: 20 x 50µL (50µL per reaction)

For high-level expression of toxic proteins, use BL21-AI™ *E. coli*, an arabinose-inducible strain that allows tight regulation and strong expression of recombinant proteins. BL21-AI™ *E. coli* is derived from BL21, constructed by cloning the exceptionally tight arabinose-inducible promoter, *araBAD*, upstream of T7 RNA polymerase on the host genome. When L-arabinose is added to the growth medium, T7 RNA polymerase is produced and binds to the T7 promoter of your expression construct, inducing expression. BL21-AI™ *E. coli* does not contain a DE3 lysogen, so it shows fast and healthy growth. Use BL21-AI™ *E. coli* with any T7 promoter-containing bacterial expression vector.

Genotype: F$^-$ *ompT hsdS*$_B$(r_B- m_B-) *gal dcm ara*B::*T7RNAP-tetA*

Figure 5 – How inducible protein expression works in BL21-AI™ *E. coli*



BL21-AI™ Cell BL21-AI™ Cell

Helpful hints for prokaryotic protein expression

Q: How can I improve protein solubility?

A:
- Lower the induction temperature to 30°C to help increase solubility and reduce the formation of inclusion bodies
- Use a low-copy number plasmid
- Use a less-rich medium, such as M9 minimal medium
- If the protein requires a cofactor, such as a metal, add the cofactor to the medium

Q: How can I improve recombinant protein yield?

A:
- Inoculate from fresh bacterial cultures, since higher protein yields are generally obtained from a fresh bacterial colony
- Use BL21 Star™(3) *E. coli*
- Check the codon usage in the recombinant protein sequence for infrequently used codons. Replacing the rare codons with more commonly used codons can significantly increase expression levels. For example, the arginine codons AGG and AGA are used infrequently by *E. coli*, so the level of tRNAs for these codons is low*
- Add protease inhibitors, such as PMSF, to buffers during protein purification. Use freshly made PMSF, since PMSF loses effectiveness within 30 min. of dilution into an aqueous solution

* Hu, X., Shi, Q., Yang, T., and Jackowski, G. (1996) *Protein Expr. Purif.* 7, 289

Unstable DNA

Many competent cell strains are *rec*A1. But there are some instances when the DNA you're trying to clone is still unstable in such cells, perhaps due to inverted or direct repeats or when your DNA is GC-rich. While such sequences are relatively com-mon in eukaryotic species, they are rare in *E. coli*. Consequently, rearrangements may occur when these sequences are introduced into standard *E. coli* strains.

Invitrogen offers two competent cell strains for cloning unstable DNA. ElectroMAX™ Stbl4™ *E. coli* is an electrocompe-tent derivative of the chemically competent MAX Efficiency™ Stbl2™ *E. coli* (Figure 6). ElectroMAX™ Stbl4™ *E. coli* offers the additional advantage of supporting blue/white color selection, single-strand DNA production, and having a higher transformation efficiency.

ElectroMAX™ Stbl4™ cells

Cat. No. 11518656

Type: Electrocompetent Efficiency:
>5 x 10^9 cfu/µg
Size: 5 x 100µL (20µL per reaction)

Genotype: *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) *rec*A1 *end*A1 *gyr*A96 *gal- thi*-1 *sup*E44 λ$^-$ *rel*A1 Δ(*lac-pro*AB)/F´ *pro*AB$^+$ *lac*I^q *lac*ZΔM15 Tn*10* Tet^R

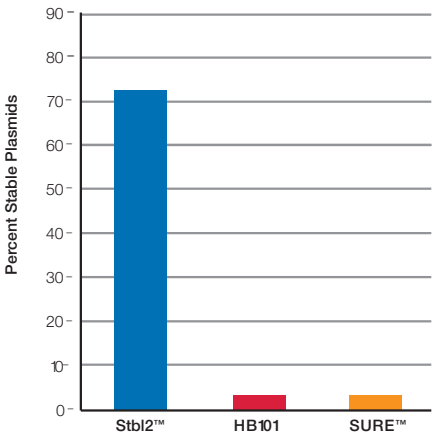
MAX Efficiency™ Stbl2™ cells

Cat. No. 10799374

Type: Chemically competent
Efficiency: >1 x 10^9 cfu/µg
Size: 5 x 200µL (100µLper reaction)

Genotype: F$^-$ *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) *rec*A1 *end*A1 *lon gyr*A96 *thi*-1 *sup*E44 *rel*A1 λ$^-$ Δ(*lac-pro*AB)

Figure 6 - Stbl2™ cells show superior stability of direct repeat sequences



Chemically competent cells were transformed with 2 to 5 ng of pH30 DNA (7.3-kb plasmid that contains ~100 repeats of a 32-bp sequence) and grown at 37°C. Plasmid DNA from randomly selected colonies was extracted and analyzed by agarose gel electrophoresis.

Helpful hints

Many unstable or less stable DNA sequences such as long terminal repeat (LTR) sequences and inverted repeats can be preferentially stabilized by performing one or more of the following:

- Incubate Stbl2™ cells and Stbl4™ cells at 30°C for 90 min. during recovery
- Grow colonies at 30°C on S.O.C. or LB agar plates
- Grow individual colonies in TB medium at 30°C
- Collect cells for DNA isolation in the mid to late period of logarithmic growth or early stationary phase, when OD_{550} is between 1 and 2 units
- Pick colonies from fresh plates, <4 days old

Single-stranded DNA (ssDNA) production

Highly purified ssDNA is used for DNA sequencing, preparation of strand-specific probes, *in vitro* mutagenesis, and subtraction library applications. For optimal ssDNA, you want hosts that are also *end*A$^+$, since double-stranded DNA is degraded in *end*A$^+$ strains. ElectroMAX™ DH12S™ *E. coli* carries the F´ episome and is *end*A$^+$.

ElectroMAX™ DH12S™ cells **Cat. No. 10675533**

Type: Electrocompetent
Efficiency: >1 x 10^{10} cfu/µg

Size: 5 x 100 µl (20 µl per reaction)

Genotype: ϕ80*lac*ZΔM15 *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) *ara*D139 Δ(*ara, leu*)7697 Δ*lac*X74 *gal*U *gal*K *rps*L(Str^R) *deo*R *nup*G *rec*A1/F´ *pro*AB$^+$ *lac*I^q *lac*ZΔM15

Propagating unmethylated DNA

Certain applications require the production of unmethylated DNA. For example, a number of restriction enzymes are sensitive to *dam* and *dcm* methylation at their recognition sites (Table 4) and will fail to cut unless the target DNA has been propagated in a *dam/dcm*-deficient strain. One Shot® INV110 is *dam/dcm* deficient. It's also *end*A1 to ensure high-quality mini-prep DNA.

One Shot™ INV110 **Cat. No. 10173762**

Type: Chemically competent
Efficiency: >1 x 10^6 cfu/µg
Size: 20 x 50µL (50µL per reaction)

Genotype: F´ *tra* Δ36*pro*AB *lac*I^q *lac*ZΔM15/*rps*L(Str^R) *thr leu endA thi-1 lac*Y *gal*K *gal*T *ara tonA tsx dam dcm dup*E44 Δ(*lac-pro*AB) Δ(*mcr*C-*mrr*) *102*::Tn*10* Tet^R

Table 4 - Restriction endonucleases inhibited by *dam* and *dcm* methlyation

Restriction endonucleases sensitive to *dam* methylation		
Acc III	*Bcl* I	*Bpm* I
*Bsa*B I	*Bsh*1365 I	*Bsp*106 I
*Bsp*H I	*Cla* I	*Dsa* I
Dpn II	*Hph* I	*Mbo* I
Mbo II	*Mfl* I	*Nde* II
Nru I	*Taq* I	*Xba* I
Xor II		

Restriction endonucleases sensitive to *dcm* methlyation		
Aat II	*Aha* II	*Apa* II
*Asp*718 I	*Ava* II	*Bal* I
Cfr I	*Dra* II	*Eae* I
*Eco*24 I	*Eco*0109 I	*Eco*R II
Fok I	*Kpn* I	*Msc* I
Mls I	*Sau*96 I	*Scr*F I
Sfi I	*Stu* I	

Propagating Gateway™ Technology vectors

Gateway™ Technology is a universal cloning and expression platform based on the well-characterized lambda phage site-specific recombination system. It provides a rapid and highly efficient route to protein expression, functional analysis, and transfer of DNA segments across multiple systems and in multiple vectors. Its efficiency is based on the strong negative selection marker *ccd*B. If this gene is expressed in a standard *E. coli* host, cell death results.

In order to propagate vectors containing the *ccd*B gene, a special strain was developed, Library Efficiency™ DB3.1™ cells. Use this strain for growing non-recombinant Gateway™ destination and donor vectors.

Recombinant baculovirus production

MAX Efficiency™ DH10Bac™ competent cells are used for production of a recombinant bacmid in the Bac-to-Bac™ Baculovirus Expression System. The DH10Bac™ *E. coli* strain contains a parent bacmid that recombines with the donor plasmid, pFastBac™, to create an expression bacmid containing the gene of interest. The expression bacmid can then be used for production of recombinant baculovirus.

MAX Efficiency™ DH10Bac™ cells **Cat. No. 10592663**

Type: Chemically competent
Efficiency: >1 x 10^8 cfu/µg
Size: 5 x 100µL (100µL per reaction)

Genotype: F$^-$ *mcr*A Δ(*mrr-hsd*RMS-*mcr*BC) ϕ80*lac*ZΔM15 Δ*lac*X74 *deo*R *rec*A1 *end*A1 *ara*D139 Δ(*ara*, *leu*)7697 *gal*U *gal*K λ$^-$ *rps*L *nup*G /bMON14272/pMON7124

Packaging formats

Invitrogen offers competent cells in the following formats:

One Shot™ kit

One Shot™ single-use aliquots are unparalleled in convenience and are available in a wide range of strains. The unique format allows you to perform the transformation directly in the tube. The single-use 50-µL aliquots mean no extra pipetting, no extra tubes, and no loss of efficiency du to repeated freeze-thaw cycles. These kits come with S.O.C. Media and pUC19 positive control.

MultiShot™ StripWell kit

MultiShot™ StripWell kits are designed for medium-throughput cloning. You can use as many or as few reactions as you want without wasting reagents. These kits come with S.O.C. Media and pUC19 positive control (not pictured). Each kit is 12 strips of eight tubes.

Packaging formats

MultiShot™ kit

MultiShot™ kits are designed for medium-to high-throughput cloning. MultiShot™ kits are available in 96-well plates, and come as complete kits, with S.O.C. Media and pUC19 positive control.

Standard kit

Standard kits are designed for scientists who perform more than one transformation at a time, for general use in a busy lab. Kits are available as 5 x 100 µl, 5 x 200 µl, and 4 x 500 µl tubes. These kits come with S.O.C. Media and pUC19 positive control.

Custom kit

Custom kits can be packaged at Invitrogen for your particular needs, with any competent cell with the efficiency and format of your choice. We can also custom design strains for your needs. Contact your local account manager.

Product	Size	Efficiency (cfu/µg)	Cat. No.
cDNA or genomic library construction using electroporation			
ElectroMAX™ DH10B™ T1 Phage-Resistant	5 x 100µL	1 x 10^{10}	12007519
ElectroMAX™ DH10B™ ElectroMAX™ Stbl4™	5 x 100µL	1 x 10^{10}	11530127
ElectroMAX™ Stbl4™	5 x 100µL	1 x 10^{10}	11518656
High-efficiency cloning, routine cloning, and subcloning			
One Shot™ Mach1™ T1 Phage-Resistant	20 x 50µL	>1 x 10^{9}	10512673
One Shot™ TOP10	10 x 50µL	>1 x 10^{9}	10368022
One Shot™ TOP10	20 x 50µL	>1 x 10^{9}	10666493
One Shot™ TOP10	40 x 50µL	>1 x 10^{9}	10358022
One Shot™ MAX Efficiency™ DH10B™ T1 Phage-Resistant	20 x 50µL	>1 x 10^{9}	10153852
One Shot™ MAX Efficiency™ DH5α™ T1 Phage-Resistant	20 x 50µL	>1 x 10^{9}	10377742
MAX Efficiency™ DH5α™	5 x 50µL	>1 x 10^{9}	11563117
Library Efficiency™ DH5α™	5 x 50µL	>1 x 10^{9}	11573117
Subcloning Efficiency™ DH5α™	4 x 50µL	>1 x 10^{9}	11583117
High-throughput cloning			
MultiShot™ StripWell Mach1™ T1 Phage-Resistant	1 plate	>1 x 10^{9}	10032732
Protein expression			
BL21-AI™ One Shot™	20 x 50µL	>1 x 10^{8}	11540146
BL21-AI™ Star (DE3) One Shot™	20 x 50µL	>1 x 10^{8}	10328512
BL21-AI™ Star (DE3) pLysS One Shot™	20 x 50µL	>1 x 10^{8}	10694963
MAX Efficiency™ DH5αF´ IQ	5 x 200µL	>1 x 10^{8}	11593117
Cloning unstable DNA			
ElectroMAX™ Stbl4™ T1	5 x 100µL	>1 x 10^{9}	11518656
MAX Efficiency™ Stbl4™	5 x 200µL	>1 x 10^{9}	10799374
Single-stranded DNA production			
MAX Efficiency™ DH12S™	5 x 100µL	1 x 10^{10}	10675533
Propagating unmethylated DNA			
One Shot™ INV110	20 x 50µL	1 x 10^{8}	10173762
Recombinant baculovirus production			
MAX Efficiency™ DH10Bac™	5 x 100µL	1 x 10^{8}	10592663

Related products ordering information

Product	Description/Application	Size	Cat. No.
Cuvettes	For electroporation, 0.1 cm	50 per bag	10573273
S.O.C.	Post-transformation recovery medium	10 x 10mL	11538916
Terrific broth	Robust growth medium. Gives increased plasmid yields	500g	11538916
Zeocin™	Antibiotic	1g	10072492
Zeocin™	Antibiotic	5g	11508976
Ampicillin	Antibiotic	20mg	10790224
X-gal	Chromogenic substrate for β-galactosidase	100mg	11538746
X-gal	Chromogenic substrate for β-galactosidase	1g	10554973
Bluo-gal	Chromogenic substrate for β-galactosidase	1g	10133862
IPTG	An inducer of β-galactosidase activity in bacteria	1g	10397642
0.8% E-Gel™ 18-pak	Bufferless, pre-cast agarose gels	18 gels	12070136
1.2% E-Gel™ 18-pak	Bufferless, pre-cast agarose gels	18 gels	12050136
2% E-Gel™ 18-pak	Bufferless, pre-cast agarose gels	18 gels	12060136
4% E-Gel™ 18-pak	Bufferless, pre-cast agarose gels	18 gels	11584996
1Kb Plus DNA Ladder	DNA sizing tool	250µg	11578636
1Kb Plus DNA Ladder	DNA sizing tool	1mg	11573127

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