

## E. coli Strains Supplied by NEB

The following *E. coli* strains are available upon request from New England Biolabs at no charge with an order or for the cost of shipping if ordered separately. They are supplied in vials containing approximately 200 µl of a 50% glycerol suspension. The strains are not competent.

The table summarizes relevant characteristics and recommended applications for each strain. Strain genotypes and brief descriptions are listed below.

	ER1793 ER1821	ER2267 ER2738	ER2925 <sup>6</sup> JM101	JM109 NMS22	ER2507 TB1	CAG597 CAG626	CAG629 PR1031	ER2508 KS1000	UT5600 CJ236
Library Construction <sup>1</sup>	+	+	+						
Plasmid Preparation <sup>2</sup>		+	+	+	+				
Cloning/Subcloning	+	+	+		+	+	+		
Dam <sup>-</sup> /Dcm <sup>-</sup>			+						
Single-stranded Phage <sup>3</sup>		+	+	+	+			+	+
Blue/White Screening		+	+	+	+	+			
RecA <sup>-</sup>		+		+					
Protease-deficient <sup>4</sup>						+	+	+	+
Lacl <sup>q</sup> (for Plac regulation)		+	+	+	+			+	
Kunkel Mutagenesis									+
Drug Resistance <sup>5</sup>	str	none	kan	tet	cam str	none	nal	none	kan str

### Footnotes

1. Restriction-deficient strain.
2. Strain has a mutation in the endA gene which eliminates the major nonspecific endonuclease.
3. Strain contains F<sup>'</sup>.
4. See strain description for details.
5. cam = chloramphenicol; kan = kanamycin; nal = nalidixic acid; str = streptomycin; tet = tetracycline
6. Also sold as ready-to-use competent cells (NEB #C2925H).

### Strains for CLONING and SUBCLONING

#### ER1793 (NEB #E4101S)

F<sup>'</sup>fluA2Δ(lacZ)r1glnV44e14<sup>-</sup>(McrA<sup>-</sup>)trp-31his-1rpsL104(Str<sup>R</sup>)xyl-7mtl-2metB1Δ(mcrC-mrr)114::IS10

Lacks native *E. coli* restriction systems; good general cloning strain (1). Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11.

#### ER1821 (NEB #E4102S)

F<sup>'</sup>glnV44e14<sup>-</sup>(McrA<sup>-</sup>)rfbD1?endA1spoT1?thi-1Δ(mcrC-mrr)114::IS10

Lacks native *E. coli* restriction systems; good general cloning strain. Different strain background from ER1793. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11.

#### ER2267 (NEB #E4103S)

F<sup>'</sup>proA<sup>+</sup>B<sup>+</sup>lacl<sup>q</sup>Δ(lacZ)M15zzf::mini-Tn10(Kan<sup>R</sup>)/Δ(argF-lacZ)U169glnV44e14<sup>-</sup>(McrA<sup>-</sup>)rfbD1?recA1endA1spoT1?thi-1Δ(mcrC-mrr)114::IS10

Lacks native *E. coli* restriction systems; good strain for cloning repetitive DNA (RecA<sup>-</sup>); can be used for blue/white screening. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11.

#### ER2738 (NEB #E4104S)

F<sup>'</sup>proA<sup>+</sup>B<sup>+</sup>lacl<sup>q</sup>Δ(lacZ)M15zzf::Tn10(Tet<sup>R</sup>)/fhuA2glnVΔ(lac-proAB)thi-1Δ(hsdS-mcrB)5

This strain is provided with the Ph.D. Phage Display Kit. Can also be used for M13 cloning/sequencing and blue/white screening. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11.

#### ER2925 (NEB #E4109S)

ara-14leuB6fhuA31lacY1tsx78glnV44galK2galT22mcrAdcm-6hisG4rfbD1R(zgb210::Tn10)TetS endA1 rpsL136 dam13::Tn9xylA-5 mtl-1 thi-1 mcrB1 hsdR2

Strain is both Dam<sup>-</sup> and Dcm<sup>-</sup>, so it is useful for production of DNA to be cut with Dam or Dcm-sensitive restriction enzymes (2,3). Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. This strain is resistant to chloramphenicol. Strain is identical to our previous Dam<sup>-</sup> Dcm<sup>-</sup> strain GM2163 except that the activity of nonspecific endonuclease I has been abolished, dramatically improving plasmid prep quality in many cases.

Also sold as ready-to-use competent cells (NEB #C2925H). See page 322.

#### JM101 (NEB #E4106S)

F<sup>'</sup>traD36 proA<sup>+</sup>B<sup>+</sup> lacl<sup>q</sup>Δ(lacZ)M15/Δ(lac-proAB)glnV thi

The original blue/white strain (4,5). Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Has all *E. coli* restriction systems.

#### JM109 (NEB #E4107S)

F<sup>'</sup>traD36 proA<sup>+</sup>B<sup>+</sup> lacl<sup>q</sup>Δ(lacZ)M15/Δ(lac-proAB)glnV44e14<sup>-</sup>gyrA96recA1relA1 endA1 thi hsdR17

Partly restriction-deficient; good strain for cloning repetitive DNA (RecA<sup>-</sup>). Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Can also be used for M13 cloning/sequencing and blue/white screening (4).

#### NMS22 (NEB #E4108S)

F<sup>'</sup>proA<sup>+</sup>B<sup>+</sup> lacl<sup>q</sup>Δ(lacZ)M15/Δ(lac-proAB)glnV thi-1Δ(hsdS-mcrB)5

Partly restriction-deficient. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Can also be used for M13 cloning/sequencing and blue/white screening (2,6).

**Strains for PROTEIN EXPRESSION (Baseline Expression)**

ER2507 (NEB #E41215)  
 F<sup>-</sup> ara-14leuB6fhuA2Δ(argF-lac)U169lacY1glnV44galK2rpsL20(Str<sup>R</sup>)xyl-5 mtl-5 Δ(malB) zjc::Tn5 (Kan<sup>R</sup>) Δ(mcrC-mrr)<sub>HB101</sub>  
 The malE gene is included in the malB deletion, so this strain does not make any MBP from the chromosome (simplifies interpretation of Western blots). Can be transformed with high efficiency, similar to RR1 and HB101. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11.

TB1 (NEB #E41225)  
 F<sup>-</sup> ara Δ(lac-proAB) [φ80dlac Δ(lacZ)M15] rpsL(Str<sup>R</sup>) thi hsdR  
 Provided with the pMAL Protein Fusion and Purification System. Gives good expression in many cases.

**Strains for PROTEIN EXPRESSION (Protease-deficient Strains)**

CAG597 (NEB #E41235)  
 F lacZ(am)pho(am)tyrT[supC(ts)]trp(am)rpsL(Str<sup>R</sup>)rpoH(am)165zhg::Tn10mal(am)  
 Defective in stress-induced proteases at high temperature. Difficult to transform—use electroporation. Suppresses amber mutations if grown at 30°C (not 37°C) and tyrosine is acceptable (7,15).

CAG626 (NEB #E41245)  
 F<sup>-</sup> lacZ(am) pho(am) lon trp(am) tyrT[supC(ts)] rpsL(Str<sup>R</sup>) mal(am)  
 Lacks Lon protease. Difficult to transform—use electroporation. Suppresses amber mutations if grown at 30°C (not 37°C) and tyrosine is acceptable (8,9).

CAG629 (NEB #E41255)  
 F lacZ(am)pho(am)lon tyrT[supC(ts)]trp(am)rpsL(Str<sup>R</sup>)rpoH(am)165zhg::Tn10 mal(am)  
 Like CAG597, but also lacks Lon protease. Best strain for expressing unstable proteins. Difficult to transform—use electroporation. Grows very poorly and is temperature sensitive. Suppresses amber mutations if grown at 30°C (not 37°C) and tyrosine is acceptable (8,9).

PR1031 (NEB #E41265)  
 F<sup>-</sup> thr:Tn10 (Tet<sup>R</sup>) dnaJ259 leu fhuA2 lacZ90(oc) lacY glnV44 thi  
 Lacks the DnaJ chaperone that can promote protein degradation (10,15). Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11.

ER2508 (NEB #E41275)  
 F<sup>-</sup> ara-14leuB6fhuA2Δ(argF-lac)U169lacY1lon::miniTn10 (Tet<sup>R</sup>)glnV44 galK2 rpsL20 (Str<sup>R</sup>) xyl-5 mtl-5 Δ(malB) zjc::Tn5 (Kan<sup>R</sup>) Δ(mcrC-mrr)<sub>HB101</sub>  
 Like ER2507, but also lacks Lon protease. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Easier to transform than CAG626 (8,11).

KS1000 (NEB #E41285)  
 F<sup>-</sup> lacI<sup>q</sup> lac<sup>+</sup> pro<sup>+</sup>/ ara Δ(lac-pro) Δ(tsp) Δ(prc)::Kan<sup>R</sup> eda51::Tn10 (Tet<sup>R</sup>) gyrA(Nal<sup>R</sup>) rpoB thi-1 argI(am)  
 Defective in Prc, a periplasmic protease, which can cleave proteins that are overexpressed in the cytoplasm when the cells are lysed to make a crude extract. The original name for this protease is Tsp (tail specific protease) (12).

UT5600 (NEB #E41295)  
 F<sup>-</sup> ara-14leuB6secA6lacY1 proC14tsx-67Δ(ompT-fepC)266entA403trpE38 rfbD1 rpsL109(Str<sup>R</sup>) xyl-5 mtl-1 thi-1  
 Deficient in OmpT, an outer membrane protease that cleaves between sequential basic amino acids. It can cleave proteins that are overexpressed in the cytoplasm when the cells are lysed to make a crude extract (13).

**Strain for site-specific KUNKEL MUTAGENESIS**

CJ236 (NEB #E41415)  
 FΔ(HindIII)::cat (Tra<sup>+</sup> Pil<sup>+</sup> Cam<sup>R</sup>)/ ung-1 relA1 dut-1 thi-1 spoT1 mcrA  
 Used for making DNA containing uracil, primarily for site-specific mutagenesis (Kunkel method). Plasmid is pCJ105; this is pOX38 (F<sup>+</sup> with deletion of small HindIII fragment) with a chloramphenicol resistance cassette added (14).

**Strains supplied as PLASMID HOSTS**

ER2420 with pACYC177 (NEB #E41515)  
 F<sup>-</sup> ara-14leu fhuA2Δ(gpt-proA)62lacY1glnV44galK2rpsL20(Str<sup>R</sup>)xyl-5 mtl-1 Δ(mcrC-mrr)<sub>HB101</sub>  
 We supply the cloning vector pACYC177 in this strain. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Strain is Amp<sup>R</sup> and Kan<sup>R</sup> (from plasmid) and Str<sup>R</sup> (from chromosome).

ER2420 with pACYC184 (NEB #E41525)  
 F<sup>-</sup> ara-14leu fhuA2Δ(gpt-proA)62lacY1glnV44galK2rpsL20(Str<sup>R</sup>)xyl-5 mtl-1 Δ(mcrC-mrr)<sub>HB101</sub>  
 We supply the cloning vector pACYC184 in this strain. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Strain is Tet<sup>R</sup> and Cam<sup>R</sup> (from plasmid) and Str<sup>R</sup> (from chromosome).

ER2420 with pBeloBAC11 (NEB #E41545)  
 F<sup>-</sup> ara-14leu fhuA2Δ(gpt-proA)62lacY1glnV44galK2rpsL20(Str<sup>R</sup>)xyl-5 mtl-1 Δ(mcrC-mrr)<sub>HB101</sub>  
 We supply the cloning vector pBeloBAC11 in this strain. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Strain is Cam<sup>R</sup> (from plasmid) and Str<sup>R</sup> (from chromosome).

POP2136 with pFOS1 (NEB #E41535)  
 F<sup>-</sup> glnV44 hsdR17 endA1 thi-1 aroB mal<sup>-</sup> c1857 lambdaDPR tet<sup>R</sup>  
 We supply the fosmid vector pFOS1 in this strain. Suppresses many amber mutations when glutamine is acceptable but not the S<sub>100</sub> or S<sub>7</sub> mutations of λ, e.g., λgt11. Strain is Amp<sup>R</sup> (from plasmid) and Tet<sup>R</sup> (from chromosome).

**References**

- (1) Kelleher, J. and Raleigh, E.A. (1991) *J. Bacteriol.*, 173, 5220–5223.
- (2) Woodcock, D.M. et al. (1989) *Nucl. Acids Res.*, 17, 3469–3478.
- (3) Palmer, B.R. and Marinus, M.G. (1994) *Gene*, 143, 1–12.
- (4) Yanisch-Perron, C., Viera, J. and Messing, J. (1985) *Gene*, 33, 103–119.
- (5) Messing, J. (1979) *Recombinant DNA Technical Bulletin (NIH)*, 2, 43–48.
- (6) Gough, J. and Murray, N. (1983) *J. Mol. Biol.*, 166, 1–19.
- (7) Baker, T.A. et al. (1984) *Proc. Nat. Acad. Sci. USA*, 81, 6779–6783.
- (8) Grossman, A.D. et al. (1983) *Cell*, 32, 151–159.
- (9) Chung, C.H. and Goldberg, A.L. (1981) *Proc. Nat. Acad. Sci. USA*, 78, 4931–4935.
- (10) Straus et al. (1988) *Genes Dev.*, 2, 1851–1858.
- (11) Kowit, J.D. and Goldberg, A.L. (1977) *J. Biol. Chem.*, 252, 8350–8357.
- (12) Silber, K.R. and Sauer R.T. (1994) *Mol. Gen. Genet.*, 242, 237–240.
- (13) Elish et al. (1988) *J. Gen. Microbiol.*, 134, 1355–1364.
- (14) Kunkel, T.A. et al. (1987). In R. Wu and L. Grossman (Eds.), *Methods in Enzymology*, Vol. 154, (pp. 367–382). San Diego: Academic Press.
- (15) Gross, C., personal communication.