

Catalog #200158

Materials provided	Quantity	Efficiency (cfu/μg of pUC18 DNA)
XL1-Blue MRF' electroporation-competent cells (yellow tubes)	5 × 100 μl	≥ 1 × 10 ¹⁰
pUC18 control plasmid (0.1 ng/μl in TE buffer)	10 μl	—

QUALITY CONTROL TESTING

BACKGROUND

XL1-Blue MRF' cells are tetracycline resistant. The XL1-Blue MRF' (Minus Restriction) strain is a restriction minus (McrA⁻, McrCB⁻, McrF⁻, Mrr⁻, HsdR⁻) derivative of Stratagene's XL1-Blue strain. XL1-Blue MRF' cells are deficient in all known restriction systems [$\Delta(mcrA)183$, $\Delta(mcrCB-hsdSMR-mrr)173$], and are endonuclease (*endA*), and recombination (*recA*) deficient. The *hsdR* mutation prevents the cleavage of cloned DNA by the *EcoK* endonuclease system, and the *recA* mutation helps ensure insert stability. The *endA1* mutation greatly improves the quality of miniprep DNA. XL1-Blue MRF' cells contain the *lacI^qZΔM15* gene on the F' episome, allowing blue-white screening for recombinant plasmids.

1. Pre-chill two sterile electroporation cuvettes (0.1-cm gap) and two sterile 1.5-ml microcentrifuge tubes thoroughly on ice. Preheat sterile SOC medium[§] to 37°C.
2. Set the electroporator to a voltage setting of 1700 V (17 kV/cm field strength). If using a Bio-Rad electroporator, set the resistance at 200 Ω and the capacitance at 25 μ F. For best results, chill the electroporator or perform the electroporation in a cold room.
3. Thaw the electroporation-competent cells on ice. After mixing the cells gently, aliquot 40 μ l of cells into each of the two pre-chilled tubes (one tube for the experimental transformation and one tube for the pUC18 control transformation). Keep the tubes on ice.
4. Add the DNA to the cells with gentle mixing. For optimal efficiency in the experimental transformation, add 1 μ l of plasmid DNA (10 pg/ μ l, in a low ionic strength buffer or dH₂O) to 40 μ l of cells. The DNA volume may be increased up to 4 μ l, but the efficiency may be reduced. Dilute the pUC18 control DNA 1:10 with sterile dH₂O, then add 1 μ l of the diluted pUC18 DNA to the other 40 μ l of cells.
5. Transfer the cell-DNA mixture to a **chilled** electroporation cuvette, tapping the cuvette until the mixture settles evenly to the bottom.
6. Slide the cuvette into the electroporation chamber until the cuvette sits flush against the electrical contacts.
7. Pulse the sample once, then quickly remove the cuvette. **Immediately** add 960 μ l of SOC medium (held at 37°C) to resuspend the cells.
8. Transfer the cells to a sterile 14-ml BD Falcon polypropylene round-bottom tube (BD Biosciences Catalog #352059). Incubate the tube at 37°C for 1 hour with shaking at 225–250 rpm.
9. Plate 5–100 μ l of the transformation mixture on LB agar plates containing the appropriate antibiotic (and containing IPTG and X-gal if color screening is desired).[§] For the pUC18 control transformation, plate 2.5 μ l of the transformation on LB-ampicillin agar plates.[§]

Some β -galactosidase fusion proteins are toxic to the host bacteria. If an insert is suspected to be toxic, plate the cells on media without X-gal and IPTG. Color screening will be eliminated, but lower levels of the potentially toxic protein will be expressed.

10. Incubate the plates at 37°C overnight (less than 24 hours, and at least 17 hours for blue-white color screening). If blue-white screening was performed, colonies containing plasmids with inserts will remain white, while colonies containing plasmids without inserts will be blue. The blue color can be enhanced by incubating the plates for two hours at 4°C following the overnight incubation at 37°C.
11. For the pUC18 control, expect 250 colonies ($\geq 1 \times 10^{10}$ cfu/ μ g pUC18 DNA). For the experimental DNA, the number of colonies will vary according to the size and form of the transforming DNA, with larger and non-supercoiled DNA producing fewer colonies.

[§]See *Preparation of Media and Reagents*.

TRANSFORMATION GUIDELINES AND TROUBLESHOOTING

Aliquoting Cells: Keep the cells on ice at all times during aliquoting. It is essential that the microcentrifuge tubes that the cells will be aliquoted into are placed on ice before the cells are thawed and that the cells are aliquoted directly into the pre-chilled tubes.

Cuvette Gap Width: Use a cuvette with a 0.1-cm gap to maximize the transformation efficiency and to minimize the possibility of arcing. A cuvette with a 0.2-cm gap is not recommended because the transformation efficiency is lower and the possibility of arcing is higher.

Quantity and Volume of DNA: The greatest efficiency is obtained from the transformation of 1 µl of 0.01 ng/µl of DNA per 40 µl of cells. The volume of DNA may be increased to up to 4 µl but the transformation efficiency may be reduced and the possibility of arcing may be increased if the DNA solution contains salts. A greater number of colonies may be obtained by increasing the amount of DNA added to the cells, although the overall efficiency may be lower.

Ionic Strength of DNA Solution: The sample DNA to be transformed by electroporation must be in a low-ionic-strength buffer, such as TE buffer or water. DNA samples containing too much salt will cause arcing at high voltage, possibly damaging both the sample and the machine.

Blue-White Color Screening: Blue-white color screening for recombinant plasmids is available when transforming host strains that contain the *lacI^qZΔM15* gene on the F' episome with a plasmid that provides α-complementation (e.g. Stratagene's pBluescript® II). When performing blue-white color screening, incubate the LB agar plates containing IPTG and X-gal at 37°C for at least 17 hours to allow color development. The blue color can be enhanced by subsequent incubation of the plates for two hours at 4°C.

Reduction of Satellite Colonies: Due to the high concentration of bacteria in electroporation, the transformation plates should be incubated at 37°C for less than 24 hours. If the incubation is to be extended beyond 24 hours, Stratagene recommends selecting for transformants on LB plates containing tetracycline (30 µg/ml) in addition to the antibiotic used to select for the transforming plasmid. Including tetracycline helps suppress satellite colony growth and does not affect the transformation efficiency. In addition, all colonies that grow in the presence of tetracycline contain an F' episome, improving blue-white color selection. This measure for reducing growth of satellite colonies may be used for all of Stratagene's electroporation competent cells, **except** the TG1 electroporation-competent cells, which are Tet^s.

PREPARATION OF MEDIA AND REAGENTS

LB Agar (per Liter) 10 g of NaCl 10 g of tryptone 5 g of yeast extract 20 g of agar Add deionized H ₂ O to a final volume of 1 liter Adjust pH to 7.0 with 5 N NaOH Autoclave	SOB Medium (per Liter) 20.0 g of tryptone 5.0 g of yeast extract 0.5 g of NaCl Add deionized H ₂ O to a final volume of 1 liter Autoclave Add 10 ml of filter-sterilized 1 M MgCl ₂ and 10 ml of filter-sterilized 1 M MgSO ₄ prior to use
LB-Ampicillin-Tetracycline Agar (per Liter) (Use for reduced satellite colony formation) 1 liter of LB agar, autoclaved Cool to 55°C Add 10 ml of 10mg/ml filter-sterilized ampicillin Add 30 mg of filter-sterilized tetracycline Pour into petri dishes (~25 ml/100-mm plate)	SOC Medium (per 100 ml) Note <i>This medium should be prepared immediately before use.</i> 2 ml of filter-sterilized 20% (w/v) glucose or 1 ml of filter-sterilized 2 M glucose SOB medium (autoclaved) to a final volume of 100 ml
LB-Ampicillin Agar (per Liter) 1 liter of LB agar, autoclaved Cool to 55°C Add 10 ml of 10mg/ml filter-sterilized ampicillin Pour into petri dishes (~25 ml/100-mm plate)	TE Buffer 10 mM Tris-HCl (pH 7.5) 1 mM EDTA

Preparation of Agar Plates for Blue-White Color Screening

To prepare plates for blue-white screening, prepare LB agar as indicated above. When adding the antibiotic, also add 5-bromo-4-chloro-3-indolyl-β-D-galactopyranoside (X-gal) to a final concentration of 80 µg/ml [prepared in dimethylformamide (DMF)] and isopropyl-1-thio-β-D-galactopyranoside (IPTG) to a final concentration of 20 mM (prepared in sterile dH₂O). Alternatively, 100 µl of 10 mM IPTG and 100 µl of 2% X-gal may be spread on solidified LB agar plates 30 minutes prior to plating the transformations. (For consistent color development across the plate, pipet the X-gal and the IPTG into a 100-µl pool of SOC medium and then spread the mixture across the plate. Do not mix the IPTG and the X-gal before pipetting them into the pool of SOC medium because these chemicals may precipitate.)

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ENDNOTES

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