

# HI-Control<sup>®</sup> BL21(DE3) & HI-Control<sup>®</sup> 10G Chemically Competent Cells



IMPORTANT!

**-80 °C Storage Required**

Immediately Upon Receipt

FOR RESEARCH USE ONLY. NOT FOR HUMAN OR DIAGNOSTIC USE

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# HI-Control<sup>®</sup> Chemically Competent Cells

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## Technical Support

Lucigen is dedicated to the success and satisfaction of our customers. Our products are tested to assure they perform as specified when used according to our recommendations. It is imperative that the reagents supplied by the user are of the highest quality. Please follow the instructions carefully and contact our technical service representatives if additional information is necessary. We encourage you to contact us with your comments regarding the performance of our products in your applications. Thank you.

### Lucigen Technical Support:

Email: [techserv@lucigen.com](mailto:techserv@lucigen.com)

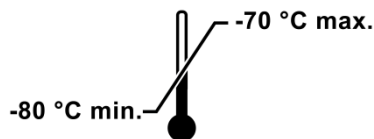
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Product Guarantee: Lucigen guarantees that this product will perform as specified for one year from the date of shipment. Please avoid using reagents for greater than one year from receipt.

# HI-Control<sup>®</sup> Chemically Competent Cells

## Components & Storage Conditions

All HI-Control<sup>®</sup> Competent Cells require storage at **-80 °C**.



### HI-Control Competent Cell kit contents

STRAIN	Efficiency (cfu/μg pUC19)	Transformations	Catalog #	Storage
HI-Control 10G Chemically Competent Cells (White cap) --Or-- HI-Control BL21(DE3) Chemically Competent Cells (Gray cap)	1 x 10 <sup>9</sup>  1 x 10 <sup>7</sup>	12 (12 x 40 μL)	60110-1  60435-1	<b>-80 °C</b>
Recovery Medium*	--	12 (1 x 12 mL)	--	<b>-20 to -80 °C</b>
Supercoiled pUC19 DNA (10 pg/μL)	--	1 x 20 μL	--	<b>-20 to -80 °C</b>

\* Additional Recovery Medium can be ordered separately as Catalog # 80026-1, 96 mL (8 x 12 mL).

## HI-Control 10G Chemically Competent Cells

HI-Control 10G cells are an *E. coli* strain optimized for high efficiency transformation. They are ideal for cloning and propagation of plasmid clones. They give high yield and high quality plasmid DNA due to the *endA1* mutation. HI-Control 10G cells harbor a single-copy BAC plasmid carrying an engineered *lacI<sup>f1</sup>* repressor allele. The *lacI<sup>f1</sup>* allele expresses approximately 170-fold more Lac repressor than does the wild-type *lacI* gene (1). The HI-Control 10G strain does not contain T7 RNA polymerase, and the excess lac repressor in this strain further minimizes any background transcription by the bacterial polymerase.

### HI-Control 10G Genotype:

*mcrA* Δ(*mrr-hsdRMS-mcrBC*) *endA1 recA1* φ80d*lacZ*ΔM15 Δ*lacX74 araD139* Δ(*ara,leu*)7697 *galU galK rpsL* (Str<sup>R</sup>) *nupG* λ<sup>-</sup> *tonA* Mini-F *lacI<sup>f1</sup>* (Gent<sup>R</sup>)

HI-Control 10G Chemically Competent Cells produce ≥ 1 x 10<sup>9</sup> cfu/μg supercoiled pUC19 DNA.

## HI-Control BL21(DE3) Chemically Competent Cells

The HI-Control BL21(DE3) cells are a derivative of BL21(DE3) with improved control over target gene expression. BL21(DE3) is the T7 host strain most commonly used for expression of cloned genes from the bacteriophage T7 promoter. This strain is a lysogen of λDE3, which harbors the T7 bacteriophage RNA polymerase gene under the control of the inducible *lacUV5* promoter. The *lacUV5* promoter is a variant of the *lac* promoter that is inducible to higher levels than its wild-type counterpart, but it also suffers from a higher basal level of activity. This basal expression of T7 RNA polymerase can lead to undesired expression of target genes cloned under a T7 promoter prior to induction. Such “leaky” expression can lead to difficulty maintaining clones in the expression host, particularly if the target gene encodes a deleterious protein. To counter this, some common T7 expression vectors harbor a copy of the *lacI* gene, encoding the lac repressor

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protein (2, 3). The lac repressor protein is responsible for maintaining inducible control over the *lacUV5* promoter as well as the T7-lac promoter on the vector. This increased copy number of *lacI* provides only partial protection against leaky expression.

The HI-Control BL21(DE3) cells contain a single-copy BAC plasmid harboring a specially engineered version of the *lacI<sup>q1</sup>* repressor allele. The *lacI<sup>q1</sup>* allele expresses approximately 170-fold more lac repressor protein than the wild-type *lacI* gene (1), or about 10-fold more repressor than expected when *lacI* is harbored on the expression vector. The increased pool of lac repressor in HI-Control BL21(DE3) cells maintains tight control over the expression of T7 RNA polymerase from the *lacUV5* promoter, reducing leaky expression of genes cloned under a T7 promoter. The excess repressor in this strain is also sufficient to bind to the *lac* operator on the T7 vectors, providing an additional level of control over expression from the T7 promoter. The abundant lac repressor does not interfere with the induction of T7 RNA polymerase or target gene expression by IPTG.

## HI-Control BL21(DE3) Genotype:

*F<sup>-</sup> ompT hsdSB (rB<sup>-</sup> mB<sup>-</sup>) gal dcm (DE3) Mini-F lacI<sup>q1</sup>(Gent<sup>R</sup>)*

HI-Control BL21(DE3) Chemically Competent Cells produce  $\geq 1 \times 10^7$  cfu/ $\mu$ g supercoiled pUC19 DNA.

## Heat Shock Transformation of HI-Control Chemically Competent Cells

HI-Control Chemically Competent Cells are provided in 40  $\mu$ L aliquots, sufficient for a single transformation. Transformation is performed by incubation on ice followed by heat shock at 42 °C. For maximal transformation efficiency, the heat shock is performed in 15 mL polypropylene culture tubes (17 x 100 mm). The use of other types of tubes may dramatically reduce the transformation efficiency. To ensure successful transformation results, the following precautions must be taken:

- All culture tubes must be thoroughly pre-chilled on ice before use.
- The cells must be completely thawed **on ice** before use.

As a control for transformation, HI-Control competent cells are provided with a vial of pUC19 DNA at a concentration of 10 pg/ $\mu$ L. Use 1  $\mu$ L (10 pg) for transformation. Select pUC19 transformants on plates containing ampicillin (100  $\mu$ g/mL).

### Transformation Protocol:

1. Remove Recovery Medium from the freezer and bring to room temperature.
2. Remove HI-Control cells from the -80 °C freezer and thaw completely on wet ice (10-15 minutes).
3. Briefly centrifuge thawed plasmid DNA to collect the solution in the bottom of the tube.
4. Transfer the cells to a pre-chilled disposable polypropylene 15 mL culture tube (17 x 100 mm).
5. Add 1  $\mu$ L of DNA (10 pg to 100 ng) to the cells. Stir briefly with pipet tip. **Do not** pipet up and down to mix, which can introduce air bubbles and warm the cells.
6. Incubate culture tube containing cells and DNA on ice for 30 minutes.
7. Heat shock cells by placing the tube in a 42 °C water bath for 45 seconds.
8. Return the tube of cells to ice for 2 minutes.
9. Immediately following the 2 minute ice incubation, add 960  $\mu$ L of room temperature Recovery Medium to the cells in the culture tube.
10. Place the tube in a shaking incubator at 250 rpm for 1 hour at 37 °C.
11. Plate 50  $\mu$ L of transformed cells on LB agar plates containing the appropriate antibiotic. For pUC19 control transformations, HI-Control BL21(DE3) cells should yield >5 colonies, and HI-Control 10G cells should yield >500 colonies.
12. Incubate the plates overnight at 37 °C.

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Transformed clones can be grown in LB, TB, or any other rich culture. Growth in TB medium typically gives the highest culture density and yield of plasmid or protein. Glucose may be added to 0.5% final concentration to further minimize expression of the recombinant plasmid.

## References

1. Glascock, C.B. and Weickert, M.J. (1998). Using chromosomal *lac*<sup>Q1</sup> to control expression of genes on high-copy-number plasmids in *Escherichia coli*. *Gene* **223**, 221.
2. Studier, F.W., Rosenberg, A.H., Dunn, J.J. and Dubendorff, J.W. (1990). Use of T7 RNA polymerase to direct expression of cloned genes. *Methods Enzymol.* **185**, 60.
3. Dubendorff, J.W. and Studier, F.W. (1991). Controlling basal expression in an inducible T7 expression system by blocking the target T7 promoter with lac repressor. *J. Mol. Biol.* **219**, 45.

## Media Recipes

### LB Lennox Agar Plates

Per liter:            10 g tryptone  
                          5 g yeast extract  
                          5 g NaCl  
                          15 g agar

### Medium for Growth of Transformants

#### LB Miller

Per liter:            10 g tryptone  
                          5 g yeast extract  
                          10 g NaCl

Add all components to deionized water. Adjust pH to 7.0 with NaOH. Autoclave and cool to 55 °C.

#### TB

Per liter:            11.8 g tryptone  
                          23.6 g yeast extract  
                          9.4 g dipotassium hydrogen phosphate (anhydrous)  
                          2.2 g potassium dihydrogen phosphate (anhydrous)  
                          0.4% glycerol

Add all components to deionized water.. Autoclave and cool to 55 °C.

## Related Lucigen Products

- [ClearColi<sup>®</sup> BL21\(DE3\) Competent Cells](#)
- [ClearColi<sup>®</sup> K-12 Competent Cells](#)
- [OverExpress<sup>™</sup> Competent Cells](#)
- [E. coli<sup>®</sup> EXPRESS BL21\(DE3\) Competent Cells](#)
- [E. coli<sup>®</sup> 10G Competent Cells](#)
- [Phage Display Electrocompetent Cells: SS320, TG1, ER2738 & MC1061 F<sup>-</sup>](#)

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