

PRODUCT INFORMATION

TransformAid

Bacterial Transformation Kit

Pub. No. MAN0012725

Rev. Date 21 November 2016 (Rev. B.00)

#\_

Lot \_ Expiry Date \_

Store at -20 °C


COMPONENTS OF THE KIT

Components	#K2710	#K2711
TransformAid Bacterial Transformation Kit	20 transformations	40 transformations
C-Medium*	35 mL	2 x 35 mL
T-Solution (A)	2 x 1.25 mL	4 x 1.25 mL
T-Solution (B)	2 x 1.25 mL	4 x 1.25 mL

\* Does not contain glucose.

CERTIFICATE OF ANALYSIS

All components of the kit were tested in transformation of *E. coli* XL1-Blue and JM107 strains using 100 pg of supercoiled pUC19 DNA. The transformation yields more than 10<sup>6</sup> transformants per µg of plasmid DNA.

Quality authorized by:  Jurgita Zilinskiene

www.thermofisher.com

For Research Use Only. Not for use in diagnostic procedures.

DESCRIPTION

Thermo Scientific™ TransformAid™ Bacterial Transformation Kit provides a new method for rapid preparation of chemically competent *E. coli* cells from overnight bacterial culture or bacterial colonies. The key component of this system is the unique T-solution, which produces competent cells in a few easy steps. The quick and convenient procedure provides transformation efficiencies in a range of 10<sup>6</sup>-10<sup>7</sup> transformants per µg of plasmid DNA. The TransformAid™ Bacterial Transformation Kit can be applied to most *E. coli* strains commonly used for cloning.

- Use **overnight bacterial culture** to prepare competent cells in only 50 min (hands on time 20 min). Then the transformation of competent *E. coli* cells takes only 5 min and the cells are plated immediately. No time is wasted on heat shock or on incubation of transformed cells in SOC medium. This transformation method saves more than one hour compared to transformation of frozen competent cells.
- Use **bacterial colonies**, if overnight culture is not available. The procedure takes 2.5 hours (hands on time 20 min), nevertheless, it allows researchers to transform *E. coli* strain of choice the same day.

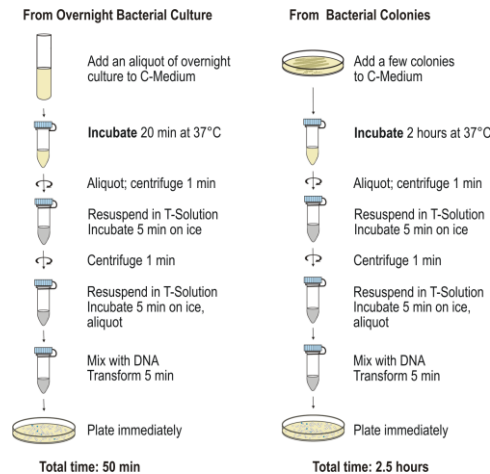


Fig. 1. Transformation procedure

STORAGE

The T-solution (A) and T-solution (B) should be stored at -20 °C till the expiry date. The C-medium can be stored at 4 °C for up to two months or at -20 °C for longer periods.

IMPORTANT NOTES

- All procedures are performed on ice. All short centrifugations can be carried out at room temperature in a regular benchtop minicentrifuge (10000-12000 x g). Make sure the cells are not left in the centrifuge at ambient temperature for more than 5 min as this will significantly decrease the transformation efficiency.

- Competent cells prepared with TransformAid bacterial transformation kit are suitable for direct use only. Freezing down and storage at -70 °C is not recommended.
- The TransformAid kit works with ampicillin, tetracycline and chloramphenicol antibiotic resistance systems. Kanamycin systems show reduced transformation efficiencies of 10<sup>5</sup> cfu/µg DNA, which are still acceptable in routine cloning experiments.
- Do not use more than 5 µL (containing 10-100 ng of vector DNA) of ligation reaction mixture per 50 µL of competent cells.

TRANSFORMATION PROTOCOLS

Please read all **IMPORTANT NOTES** before starting.

Transformation Protocol from Overnight Bacterial Culture (for 2 transformations)

- The day before the transformation seed overnight culture by inoculating 2 mL\* of C-medium with a single bacterial colony. Make sure to use freshly streaked bacterial colonies (not older than 10 days\*\*). Incubate the culture overnight at 37 °C in a shaker.
- The day of transformation pre-warm culture tubes containing the required amount of C-medium (1.5 mL for each 2 transformations) at 37 °C for at least 20 min. Pre-warm LB agar plates, supplemented with appropriate antibiotic in a 37 °C incubator for at least 20 min before plating.
- Prepare T-solution: thaw T-solution (A) and T-solution (B), mix contents thoroughly. Combine 250 µL of T-solution (A) and 250 µL of T-solution (B) in a separate tube and keep on ice.

Step	Procedure
1	Add 150 µL of the overnight bacterial culture to 1.5 mL of pre-warmed C-medium. Incubate 20 min at 37 °C in a shaker.
2	Pellet bacterial cells by 1 min centrifugation, discard the supernatant.
3	Resuspend cells in 300 µL of T-solution. Incubate on ice for 5 min.
4	Centrifuge for 1 min in a microcentrifuge, discard the supernatant.
5	Resuspend pelleted cells in 120 µL of T-solution. Incubate 5 min on ice.
6	Add up to 5 µL of ligation mixture (containing 10-100 ng vector DNA) or 1 µL of supercoiled DNA (10-100 pg) into new microcentrifuge tubes. Chill on ice for 2 min.
7	Add 50 µL of the prepared cells to each tube containing DNA, mix and incubate on ice for 5 min.
8	Plate immediately on pre-warmed LB antibiotic agar plates. Incubate overnight at 37 °C.

\* 2 mL of overnight culture is sufficient for 26 transformations. The culture can be kept at 4 °C for one week and used for preparation of competent cells.

\*\* *E. coli* DH5α™ should only be <24 hours fresh.

Transformation Protocol from Bacterial Colonies (for 2 transformations)

- Seed a LB plate with a single bacterial colony using the streak plate method and incubate the plate overnight at 37 °C. Use freshly streaked bacterial colonies (not older than 10 days\*), for preparation of competent cells.
- Before the transformation pre-warm culture tubes containing the required amount of C-medium (1.5 mL for each 2 transformations) at 37 °C for at least 20 min. Pre-warm LB antibiotic agar plates in a 37 °C incubator for at least 20 min before plating.
- Prepare T-solution: thaw T-solution (A) and T-solution (B), mix contents thoroughly. Combine 250 µL of T-solution (A) and 250 µL of T-solution (B) in a separate tube and keep on ice.

Step	Procedure
1	Transfer a portion of freshly streaked bacterial culture (4 x 4 mm size) to 1.5 mL of pre-warmed C-medium using an inoculating loop. Suspend the cells by gently mixing and incubate the tubes at 37 °C for 2 hours in a shaker.
2	Pellet bacterial cells by 1 min centrifugation, discard the supernatant.
3	Resuspend cells in 300 µL of T-solution. Incubate on ice for 5 min.
4	Centrifuge for 1 min in a microcentrifuge, discard the supernatant.
5	Resuspend pelleted cells in 120 µL of T-solution. Incubate 5 min on ice.
6	Add up to 5 µL of ligation mixture (containing 10-100 ng vector DNA) or 1 µL of supercoiled DNA (10-100 pg) into new microcentrifuge tubes. Chill on ice for 2 min.
7	Add 50 µL of the prepared cells to each tube containing DNA, mix and incubate on ice for 5 min.
8	Plate immediately on pre-warmed LB antibiotic agar plates. Incubate overnight at 37 °C.

\* *E. coli* DH5α should only be <24 hours fresh.

Scaling up

To prepare larger volumes of competent cells for transformation the procedure can be scaled up by increasing volumes of all components accordingly. In steps 2 and 4 the cells are centrifuged in large centrifuge tubes at 5000-10000 x g for 5 min at 4 °C.

Plaque Formation

For plaque formation follow 1-5 steps of one of transformation protocols above. In step 6 use 10 ng of double-stranded phage DNA (e.g. M13mp19) to transform cells. In step 8, mix the transformed cells (from step 7) with 4 mL of top agar (0.7%, 55 °C). Mix gently and pour the soft agar/cell mixture onto an agar plate. The number of plaques obtained depends on the bacterial strain used (e.g. Cj236: ~60 plaques, JM109: ~350 plaques).

## CONTROL TRANSFORMATION

Control transformation with 100 pg of supercoiled DNA (e.g. pUC18 DNA, #SD0051) should yield approximately 100 - 2000 colonies depending on the bacterial strain and antibiotic resistance system used.

### Sample calculation:

If 500 colonies are counted on a control plate, the transformation efficiency is calculated as follows:

$$\frac{500 \text{ cfu on control plate}}{0.1 \text{ ng of control DNA plated}} \times 1000 \text{ ng}/\mu\text{g} = 5 \times 10^6 \text{ cfu}/\mu\text{g DNA}$$

## LIGATION PROTOCOLS

### DNA Insert Ligation into Vector DNA

1. Prepare the following reaction mixture:

Component	Sticky-end ligation	Blunt-end ligation
Linear vector DNA	20-100 ng	
Insert DNA	1:1 up to 5:1 molar ratio over vector	
10X T4 DNA Ligase buffer	2 $\mu\text{L}$	
50% PEG 4000 solution*	-	2 $\mu\text{L}$
T4 DNA Ligase (#EL0014)	0.2 $\mu\text{L}$ (1 U)	1 $\mu\text{L}$ (5 U)
Water, nuclease-free (#R0581)	to 20 $\mu\text{L}$	
<b>Total volume</b>	<b>20 <math>\mu\text{L}</math></b>	<b>20 <math>\mu\text{L}</math></b>

\* 50% PEG 4000 solution is provided with Thermo Scientific T4 DNA Ligase (supplied with PEG).

- Sticky-ends: incubate for 10 min at 22 °C.  
Blunt-ends: incubate for 1 hour at 22 °C.
- Use up to 5  $\mu\text{L}$  of the mixture for transformation of 50  $\mu\text{L}$  of prepared competent cells.

### Note

- To increase the overall number of transformants, prolong the reaction time to 1 hour.
- T4 DNA Ligase inactivated by heating at 65 °C for 10 min or at 70 °C for 5 min.

### Self-circularization of Linear DNA

1. Prepare the following reaction mixture:

Linear DNA	10-50 ng
10X T4 DNA Ligase buffer	5 $\mu\text{L}$
T4 DNA Ligase (#EL0014)	1 $\mu\text{L}$ (5 U)
Water, nuclease-free (#R0581)	to 50 $\mu\text{L}$
<b>Total volume</b>	<b>50 <math>\mu\text{L}</math></b>

- Mix thoroughly, spin briefly and incubate for 10 min at 22 °C.
- Use up to 5  $\mu\text{L}$  of the mixture for transformation of 50  $\mu\text{L}$  of prepared competent cells.

### Note

- To increase the overall number of transformants, prolong the reaction time to 1 hour.
- T4 DNA Ligase inactivated by heating at 65 °C for 10 min or at 70 °C for 5 min.

## RECIPES

### Ampicillin Stock Solution (50 mg/mL)

Dissolve 2.5 g of ampicillin sodium salt in 50 mL of deionized water. Filter sterilize and store in aliquots at -20 °C.

### X-Gal Stock Solution (20 mg/mL)

Dissolve 200 mg of X-Gal (5-bromo-4-chloro-3-indolyl-b-D-galactopyranoside) (#R0404) in 10 mL dimethylformamide (DMF) or dimethylsulfoxide (DMSO). Store at -20 °C in a dark. Alternatively, use X-Gal Solution, ready-to-use (#R0941). Spread 40  $\mu\text{L}$  on plate surface.

### IPTG Stock Solution (100 mM)

Dissolve 1.2 g of IPTG (isopropyl-b-D-thiogalactopyranoside) (#R0392) in 50 mL of deionized water. Filter-sterilize, aliquote and store at -20 °C. Alternatively, use IPTG Solution, ready-to-use (#R1171). Spread 40  $\mu\text{L}$  on plate surface.

### LB antibiotic Plates

Prepare LB agar medium (1 liter), weigh out:

Bacto Tryptone	10 g,
Bacto Yeast extract	5 g
NaCl	5 g.

Dissolve in 800 mL of water, adjust pH to 7.0 with NaOH and adjust the volume with water to 1000 mL. Add 15 g of agar and autoclave.

Before pouring LB ampicillin agar plates, allow the medium to cool to 55 °C. Then, add 1 mL of ampicillin stock solution (50 mg/mL) to a final concentration of 50  $\mu\text{g}/\text{mL}$ \*. Mix gently and pour plates. Allow the LB ampicillin agar medium to solidify.

For blue/white selection, spread 40  $\mu\text{L}$  of each X-Gal stock solution (20 mg/mL) and IPTG stock solution (100 mM) on the surface of the plate. Alternatively, for batch use, add 1  $\mu\text{L}$  of each stock per 1 mL of LB agar (cooled to 55 °C).

\*When using other antibiotics, the following final concentrations are recommended: kanamycin, 30  $\mu\text{g}/\text{mL}$ ; tetracycline, 12  $\mu\text{g}/\text{mL}$ ; chloramphenicol, 20  $\mu\text{g}/\text{mL}$ .

## TROUBLESHOOTING

Problem	Cause and Solution
Transformation efficiency is too low (evaluated in control transformation with supercoiled DNA)	<p><b>Old bacterial cultures were used to prepare competent cells.</b> Seed overnight culture from a freshly streaked bacterial culture plate. Refresh bacterial strains weekly. For seeding of overnight <i>E. coli</i> DH5<math>\alpha</math> culture, use only &lt;24 hours fresh culture plates.</p>
Low number or no transformants	<p><b>Volume of ligation reaction mixture too large.</b> Do not use more than 5 <math>\mu\text{L}</math> of ligation reaction mixture per 50 <math>\mu\text{L}</math> of competent cells.</p> <p><b>DNA amount is too high.</b> Do not use more than 100 ng of plasmid DNA for transformation of 50 <math>\mu\text{L}</math> of competent cells.</p> <p><b>Inefficient ligation.</b> Simple sticky end ligation reactions should yield 50-200 colonies. If the efficiency of competent cells was acceptable, but transformation of ligation mixture yielded no or only few transformants, repeat cloning experiment. Use high quality DNA, enzymes and follow the recommended ligation protocol.</p>
Background colonies without plasmid	<p><b>Insufficient amount of antibiotic in agar medium.</b> Use recommended amount of appropriate antibiotic in LB agar plates. Antibiotics are heat-sensitive therefore allow the LB medium to cool to 55 °C before addition of the antibiotic to it.</p> <p><b>Satellite colonies.</b> Some fast growing strains (e.g. C600) lead to formation of smaller satellite colonies around transformants after &gt;16 hours of incubation. Use shorter incubation times and do not involve such small colonies into clone analysis.</p>

### LIMITED USE LABEL LICENSE: Internal Research and Development Use Only.

The purchase of this product conveys to the buyer the limited, non-exclusive, non-transferable right (without the right to resell, repackaging, or further sublicense) to use this product for internal research and development purposes. No other license is granted to the buyer whether expressly, by implication, by estoppel or otherwise. In particular, the purchase of the product does not include or carry any right or license to use, develop, or otherwise exploit this product commercially and no rights are conveyed to the buyer to use the product or components of the product for purposes including but not limited to provision of services to a third party, generation of commercial databases or clinical diagnostics. This product is sold pursuant to authorization from Thermo Fisher Scientific and Thermo Fisher Scientific reserves all other rights. For information on purchasing a license for uses other than internal research and development purposes, please contact [outlicensing@lifetech.com](mailto:outlicensing@lifetech.com) or Out Licensing, Life Technologies Inc., 5781 Van Allen Way, Carlsbad, California 92008.

### PRODUCT USE LIMITATION

This product is developed, designed and sold exclusively for research purposes and *in vitro* use only. The product was not tested for use in diagnostics or for drug development, nor is it suitable for administration to humans or animals. Please refer to [www.thermofisher.com](http://www.thermofisher.com) for Material Safety Data Sheet of the product.

© 2016 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific Inc. and its subsidiaries.