



# E. coli Host Cell DNA Extraction & Amplification Kit in 96 Well Plate

## DNA Extraction and Amplification Kit for the Measurement of Residual E. coli Host Cell DNA Catalog # D415W

### Intended Use

This kit is intended for use in determining the presence of host cell DNA contamination in products manufactured by recombinant expression in *E. coli* cell lines. This kit contains reagents for DNA extraction as well as calibrated DNA concentrate and primers for DNA amplification. The kit does not contain the PCR master mix. PCR master mix must be purchased separately from Life Technologies Corporation or other licensed vendor.

The kit is for **Research, Development and Manufacturing Use Only** and is not intended for diagnostic use in humans or animals.

### Summary and Explanation

Expression of therapeutic proteins in *E. coli* cells is a cost effective method for production of commercial quantities of a drug substance. However, the manufacturing and purification process of these products leaves the potential for DNA contamination from the host cells. Due to the theoretical potential for the transfer of oncogenes from the host cell, the WHO has set a residual host cell DNA limit of 10ng/dose. Regulatory agencies have set allowable limits between 100pg/dose and 10ng/dose depending on the cell line used as well as the mode and frequency of dosing.

This kit is designed to measure residual host cell DNA for the purpose of process development, in-process monitoring, lot release and QC testing. Quantitative PCR (qPCR) based assays have been employed by many biopharmaceutical manufacturers over the years. However, in many cases proteins and buffer components can interfere with DNA amplification resulting in either over or under estimation of the true DNA concentration. This kit uses a proprietary DNA extraction procedure to isolate the residual DNA from complex matrices and perform the measurements in an environment free from contaminating proteins, salts and detergents. The removal of contaminating product protein and other excipients ensures accurate

measurements of residual host cell DNA and allows for timely and scientifically sound process decisions.

### Principle of the Procedure

This convenient, easy-to-use kit is compatible with your existing qPCR reagents and instruments. In addition to all materials required for Cygnus' proprietary extraction of DNA to remove PCR interfering components, the kit includes DNA concentrate for preparation of standards and a validated cell-line specific primer set. Upon completion of extraction of residual DNA, the sample, standards, and controls are transferred to a qPCR plate containing a user supplied master mix to which the Cygnus primer mix has been added. After sealing the plate with the supplied optical seal, the qPCR plate is subjected to 35–40 amplification cycles. A standard curve is constructed from the point at which each standard crosses a pre-established threshold. The samples and controls are measured against the standard curve to determine the concentration of DNA. Using this method residual DNA can be measured to 1 part per billion levels.

### Reagents & Materials Provided

Component	Product #
<b>DNA Extraction:</b>	
Proteinase K, 1 x 150µL	D101
DNA Extraction Buffer, 1 x 30mL	D105
DNA Precipitation Buffer, 1 x 55mL	D106
DNA Wash Buffer, 1 x 170mL	D104
Deep Well Extraction Plate with Sealing Mat, 1 x 96 well plate	D102*
DNA Sample Diluent, 1 x 30mL	D006*
<b>DNA Amplification:</b>	
<i>E. coli</i> DNA Concentrate, 100ng/10µL x 120µL	D418
<i>E. coli</i> Forward and Reverse Primer Mix, 350µL	D417
PCR Assay Plate with Optical Seal, 1 x 96 wells	D004*

\*Component can be purchased separately.

## Storage & Stability

All reagents should be stored at 2°C to 8°C for stability until the expiration date printed on the kit label.

## Materials & Equipment Required But Not Provided

- qPCR master mix (Life Technologies Corp. or other licensed vendor)
- Pipettors – 5µL – 1200µL
- Bench top centrifuge capable of spinning a microplate at 3,200 x g.
- Microtiter plate shaker with 1000rpm capability. (Recommended: THERMO Titer Plate Shaker, Model: 4625)
- DNA TE Buffer, Cat# D001 (Tris/EDTA used for Proteinase K dilution and final pellet reconstitution)
- Dry heat block with microplate adapter
- Plate sealer/pasta roller
- Vortex
- Spray bottle
- Absorbent wipes

## Precautions

- For Research, Development or Manufacturing use only.
- This kit should only be used by qualified technicians.

## Preparation of Reagents

Bring all reagents to room temperature prior to starting the extraction procedure.

### Preparation of the Assay Standard Curve

Prepare the Standard Curve by making 10-fold dilutions of the DNA Concentrate according to the table below. Discard tubes 1-3.

Tube #	<i>E. coli</i> DNA	Sample Diluent	Final Concentration
1	Stock	N/A	100ng/10µL
2	100 µL of Tube 1	900 µL	10ng/10µL
3	100 µL of Tube 2	900 µL	1ng/10µL
4	100 µL of Tube 3	900 µL	100pg/10µL
5	100 µL of Tube 4	900 µL	10pg/10µL
6	100 µL of Tube 5	900 µL	1pg/10µL
7	100 µL of Tube 6	900 µL	0.1pg/10µL
8	100 µL of Tube 7	900 µL	0.01pg/10µL
9	0 µL	900 µL	0pg/10µL

## Procedural Notes

1. Protein in the sample is a known interference factor in DNA quantification methods. Use of the proprietary Cygnus DNA Sample Diluent (Cat# D006) will generally allow for acceptable DNA recovery in up to 20mg/mL of protein. Samples with higher protein concentrations can be used but must be qualified in the assay.

2. Due to the extreme sensitivity of this assay it is important to keep the working area clean to avoid contamination by DNA in the environment. Thoroughly clean pipettes and the immediate working area prior to initiating the procedure. Remove anything from the area that is not required for the procedure.

3. Avoid leaning over or passing over the extraction plate as much as possible. Organize solutions and tips in a manner that minimizes the need to pass over the plate.

4. The proteinase K digestion should be carried out at 60°C for most therapeutic proteins. Monoclonal antibodies generally perform well at 60°C. However, each laboratory may need to determine the optimum temperature for non-IgG drug products. **Do not exceed 60°C as this may cause the protein to precipitate from solution.**

5. Always make sure the centrifuge is balanced to within 0.5g to ensure proper assay performance. An improperly balanced centrifuge can result in loose pellets, which can adversely affect recovery and assay precision.

6. We recommend using a pasta roller to ensure a secure fit of the Sealing Mat onto the 96 deep well plate.

7. While it is possible to seal off wells for use of a partial plate, Cygnus recommends using a new plate for each DNA extraction to prevent contamination. However, if only part of the extraction plate is to be used, you can seal the unused wells with the sealing mat, and cut the mat at that point. The unused wells should remain sealed throughout the procedure. Please visit our website or contact Customer Service to purchase additional Deep Well Extraction plates, Catalog # D102.

8. **Complete removal of residual liquid from the extraction plate after each spin is essential for proper assay performance.** Continuously tap the plate until free of all visible liquid.

9. Cygnus Technologies has determined that various brands of paper towels have different levels of lint and dust. Even towels and wipes that claim to be lint-free can affect results. To keep lint and dust down, we suggest gently misting the towels with either TE (10mM Tris, 1 mM EDTA) or distilled water with a standard spray bottle prior to tapping out the tubes or plate.

## Limitations

Two DNA Extraction protocols are available. The DNA Extraction in this kit is performed in a 96 deep well plate. If you do not have the ability to spin deep well plates at 3,200 x g and would prefer to perform the extraction in microtubes, please order Catalog #D415T, *E. coli* Host Cell DNA Extraction and Amplification Kit in Tubes.

## DNA Extraction Protocol

1. Proteinase K must be diluted fresh for each assay run. Prepare only the amount of 1:10 diluted Proteinase K required for that run. For example, if the assay requires 50 wells, add 75µL of Proteinase K to 675µL of DNA TE Buffer, (Cat # D001) or other qualified TE buffer.
2. Dilute all test samples to DNA concentrations within the analytical range of the curve and to < 20mg/mL total protein using DNA Sample Diluent (Cat# D006). All samples should be diluted at least 1:2.
3. Transfer 250µL of each Standard, test sample, and control to the deep well plate and perform all required spiking and diluting. If samples are being diluted in the plate, ensure final volume in wells is 250µL.
4. Add 12.5µL of diluted Proteinase K to each well. Mix by pipetting up and down or by sealing the plate and shaking for 30 seconds on the plate shaker.
5. Seal the plate with the sealing mat, and incubate at 60°C for 30 minutes, in a dry heat block with a microplate adapter.
6. Centrifuge at 3,200 x g for 1 minute to recover any condensation on the sealing mat.
7. Add 250µL of Extraction Buffer to Standards, controls and test samples. Reseal the plate and incubate on the plate shaker (~800rpm) for 5 minutes.
8. Add 500µL of Precipitation Buffer to each well. Reseal the plate and incubate on the plate shaker (~1,000rpm) for 15 minutes.
9. Remove the plate from the shaker and centrifuge the plate at 3,200 x g in a bench top centrifuge for 20 minutes.
10. Decant supernatant. Remove additional liquid by tapping the plate upside down on lightly misted lint-free wipes.
11. Add 0.8mL of DNA Wash Buffer to the wells in the plate. Reseal the plate and incubate on the plate shaker (~1000rpm) for 10 minutes.
12. Centrifuge at 3,200 x g for 5 minutes. (Continued)

## DNA Extraction Protocol (Continued)

13. Decant supernatant. Remove additional liquid by tapping the plate upside down on lightly misted lint-free wipes.
14. Add 0.8mL of DNA Wash Buffer to the wells in the plate. Reseal the plate and incubate on the plate shaker (~1000rpm) for 5 minutes.
15. Centrifuge at 3,200 x g for 5 minutes.
16. Decant supernatant. Remove additional liquid by tapping the plate upside down on lightly misted lint-free wipes.
17. Re-suspend the pellets in 125µL/well of DNA TE Buffer (Cat# D001) pre-warmed to ~ 50°C.
18. Seal the plate and incubate at room temperature on the plate shaker (~800rpm) for 5 minutes.
19. The *E. coli* DNA is now ready for amplification or downstream applications requiring high quality purified DNA.

## Amplification Protocol

1. The amplification reagent is prepared by combining the *E. coli* Primer Mix, Cat# D417, with PCR master mix. Cygnus recommends using Power SYBR® Green PCR Master Mix supplied by Life Technologies Corporation or a master mix from another licensed vendor.
2. Prepare 15µL of the amplification reagent for each well plus an additional 25% excess. For example, 96 wells + 25% = enough amplification reagent for 120 wells.

Reagent	µL/Reaction	Total volume to prepare for 120 wells (µL)
<i>E. coli</i> Primer Mix	2.5µL	300µL
PCR master mix	12.5µL	1500µL

3. Transfer 15µL of amplification reagent to each well of the qPCR assay plate (Cat# D004).
4. Transfer 10µL of each standard, test sample and control to the qPCR assay plate. We recommend testing each sample in triplicate.
5. Apply the optical seal over the wells.
6. Gently tap the side of the plate to remove all bubbles from the bottom of the wells.
7. Place the assay plate into the qPCR instrument.
8. Suggested amplification parameters:  
1st cycle: 95°C for 10 minutes.  
35-40 cycles: 95°C for 15 seconds then 55°C for 1 minute.

## Calculation of Results

The  $C_T$  values of the standards are used to construct a standard curve with values reported by the instrument in pg/10 $\mu$ L host cell DNA. The concentration of host cell DNA can be mathematically transformed for reporting residual DNA in ng/mL, ng/mg of drug product or in ng/dose.

## Performance Characteristics

Cygnus Technologies has qualified this assay by conventional criteria as indicated below. A more detailed copy of this "Qualification Summary" report can be obtained by request. This qualification is generic in nature and is intended to supplement but not replace certain user and product specific qualification and validation that should be performed by each laboratory. At a minimum each laboratory is urged to perform a spike and recovery study for each sample type to be tested in the assay. Each laboratory technician should also demonstrate competency in the assay by performing a similar precision study to that described below. A more detailed discussion of recommended user validation protocols can be obtained by contacting our Technical Services Department or at our web site.

## qPCR Amplicon

The primer set provided in this kit will amplify a single region of the *E. coli* DNA producing an amplicon of 120 base pairs with a  $T_m$  of 80.6 +/- 0.3.

## Accuracy and Precision

*E. coli* DNA samples were prepared in a 10mg/mL human IgG sample matrix containing DNA Sample Diluent (Cat# D006) at various concentrations spanning the Standard Curve. Eight preparations were made for each sample resulting in 16 individual results per concentration. The assays were performed over 2 days.

Concentration	% Nominal	Intra-assay CV	Inter-assay CV
50 pg/10 $\mu$ L	95%	9.0%	10.0%
5 pg/10 $\mu$ L	99%	7.0%	9.2%
0.5 pg/10 $\mu$ L	102%	9.7%	12.6%
0.05 pg/10 $\mu$ L	105%	17.5%	17.1%

## Ordering Information/ Customer Service

To place an order or to obtain additional product information contact *Cygnus Technologies*:

[www.cygnustechnologies.com](http://www.cygnustechnologies.com)

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**Power SYBR® Green PCR Master Mix** is a registered trademark of Life Technologies Corporation.