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TRα-GAL4 Luciferase Reporter HEK293 Cell Line (Thyroid Hormone Receptor α Pathway)

#82633

Description

The TRα-GAL4 Luciferase Reporter HEK293 Cell Line is a HEK293 cell line expressing firefly luciferase under the control of the GAL4 upstream activation sequence (UAS) with constitutive expression of human thyroid receptor α ligand binding domain fused to the DNA binding domain (DBD) of GAL4 (GAL4 DBD). This system allows specific detection of thyroid hormone-induced activation of the thyroid receptor α with low cross-reactivity from other nuclear receptors.

This cell line has been validated by stimulation with triiodothyronine (T-3).

Background

Thyroid hormones are essential for regulating metabolism and overall growth and development in the body. These hormones act by way of nuclear receptors, TRα and TRβ, encoded by genes THRA and THRB respectively. Thyroid hormone receptors act as ligand dependent transcription factors regulating the production of target genes via interactions with co-activators, co-repressors, as well as other general transcription factors. Differentially expressed in the human body, TRα is widely expressed in the central nervous system, heart, skeletal muscle, and gastrointestinal tract whereas TRβ is expressed in the liver, kidney, pituitary, and hypothalamus. Studies have identified various mutations in the THRA gene to be correlated with resistance to thyroid hormone alpha and tissue-specific hypothyroidism.

Application

Screen for TRα agonists

Materials Provided

Components	Format
2 vials of frozen cells	Each vial contains >1 x 10^6 cells in 1 ml of Cell Freezing Medium (BPS Bioscience #79796)

Parental Cell Line

HEK293, Human Embryonic Kidney, epithelial-like cells, adherent

Mycoplasma Testing

The cell line has been screened to confirm the absence of Mycoplasma species.

Materials Required but Not Supplied

These materials are not supplied with the cell line but are necessary for cell culture and cellular assays. BPS Bioscience's reagents are validated and optimized for use with this cell line and are highly recommended for best results. Media components are provided in the Media Formulations section below.

Media Required for Cell Culture

Name	Ordering Information
Thaw Medium 1	BPS Bioscience #60187
Growth Medium 1M	BPS Bioscience #79723

Materials Required for Cellular Assay

Name	Ordering Information
Assay Medium 6B	BPS Bioscience #82202
3, 3', 5-Triiodo-L-thyronine (T-3)	Cayman #16028
96-well tissue culture treated white clear-bottom assay plate	Corning #3610
ONE-Step™ Luciferase Assay System	BPS Bioscience #60690
Luminometer	

Storage Conditions

Cells are shipped in dry ice and should immediately be thawed or stored in liquid nitrogen upon receipt. Do not use a -80°C freezer for long term storage. Contact technical support at support@bpsbioscience.com if the cells are not frozen in dry ice upon arrival.

Media Formulations

For best results, the use of validated and optimized media from BPS Bioscience is *highly recommended*. Other preparations or formulations of media may result in suboptimal performance.

Note: Thaw Media do *not* contain selective antibiotics. However, Growth Media *do* contain selective antibiotics, which are used to maintain selective pressure on the cell population expressing the gene of interest. Cells should be grown at 37°C with 5% CO_2. BPS Bioscience's cell lines are stable for at least 10 passages when grown under proper conditions.

Media Required for Cell Culture

Thaw Medium 1 (BPS Bioscience #60187):

MEM medium supplemented with 10% FBS, 1% non-essential amino acids, 1 mM Na pyruvate, 1% Penicillin/Streptomycin.

Growth Medium 1M (BPS Bioscience #79723):

MEM medium supplemented with 10% FBS, 1% non-essential amino acids, 1 mM Na pyruvate, 1% Penicillin/Streptomycin, 400 µg/ml of G418, and 0.5 µg/ml of Puromycin.

Media Required for Functional Cellular Assay

Assay Medium 6B (BPS Bioscience #82202):

Phenol-Red Free DMEM supplemented with 2% Charcoal Stripped FBS, 1% Penicillin/Streptomycin, and 1% GlutaMAX™.

Cell Culture Protocol

Note: HEK293 cells are derived from human material and thus the use of adequate safety precautions is recommended.

Cell Thawing

1. Swirl the vial of frozen cells for approximately 60 seconds in a 37°C water bath. As soon as the cells are thawed (it may be slightly faster or slower than 60 seconds), quickly transfer the entire contents of the vial to a tube containing 10 ml of pre-warmed Thaw Medium 1.

   Note: Leaving the cells in the water bath at 37°C for too long will result in rapid loss of viability.

2. Immediately spin down the cells at 300 *x g* for 5 minutes, remove the medium and resuspend the cells in 5 ml of pre-warmed Thaw Medium 1.

3. Transfer the resuspended cells to a T25 flask or T75 flask and incubate at 37°C in a 5% CO_2 incubator.

4. After 24 hours of culture, check for cell attachment and viability. Change medium to fresh Thaw Medium 1 and continue growing in a 5% CO_2 incubator at 37°C until the cells are ready to passage.

5. Cells should be passaged before they are fully confluent. At first passage and subsequent passages, use Growth Medium 1M.

Cell Passage

1. Aspirate the medium, wash the cells with Phosphate Buffered Saline (PBS) without Ca^{2+}/Mg^{2+}, and detach the cells from the culture vessel with 0.05% Trypsin/EDTA.

2. Once the cells have detached, add Growth Medium 1M and transfer to a tube.

3. Spin down cells at 300 *x g* for 5 minutes, remove the medium and resuspend the cells in Growth Medium 1M.

4. Seed into new culture vessels at the recommended sub-cultivation ratio of 1:6 to 1:12 once or twice per week.

Cell Freezing

1. Aspirate the medium, wash the cells with PBS without Ca^{2+}/Mg^{2+}, and detach the cells from the culture vessel with 0.05% Trypsin/EDTA.

2. Once the cells have detached, add Growth Medium 1M and count the cells.

3. Spin down the cells at 300 *x g* for 5 minutes, remove the medium and resuspend the cells in 4°C Cell Freezing Medium (BPS Bioscience #79796) at ~2 x 10^6 cells/ml.

4. Dispense 1 ml of cell suspension into each cryogenic vial. Place the vials in an insulated container for slow cooling and store at -80°C overnight.

5. Transfer the vials to liquid nitrogen the next day for long term storage.

Note: It is recommended to expand the cells and freeze at least 10 vials at an early passage for future use.

A. Validation Data

- The following assay was designed for a 96-well format. To perform the assay in different tissue culture formats, the cell number and reagent volume should be scaled appropriately.
- All conditions should be performed in triplicate.
- The assay should include "Stimulated Cells", "Background Control" and "Unstimulated Control" conditions.

A. Dose Response of TRα-GAL4 Luciferase Reporter HEK293 Cell Line to T-3

1. Harvest TRα-GAL4 Luciferase Reporter HEK293 cells from culture in Growth Medium 1M and seed cells at a density of 20,000 ~ 40,000 cells per well in 90 µl of Assay Medium 6B into a white clear-bottom 96-well microplate. Leave empty wells as cell-free control wells ("Background Control").

2. Prepare a serial dilution of T-3 in Assay Medium 6B at 10x the final testing concentrations (10 µl/well).

3. Add 10 µl of diluted T-3 to the "Stimulated Cells" wells.

4. Add 10 µl of Assay Medium 6B to the "Unstimulated Control" wells.

5. Add 100 µl of Assay Medium 6B to "Background Control" wells (cell-free wells).

6. Incubate at 37°C with 5% CO_2 for 16 ~ 24 hours.

7. Add 100 µl of ONE-Step™ Luciferase reagent per well.

8. Incubate at Room Temperature (RT) for ~10 minutes.

9. Measure luminescence using a luminometer.

10. The "Background Control" luminescence value should be subtracted from all readings.

11. Data Analysis: Subtract the average background luminescence from the luminescence reading of all other wells. The fold induction of luciferase reporter expression is the average background-subtracted luminescence of stimulated wells divided by the average background-subtracted luminescence of unstimulated control wells.

$$Fold\ induction = \frac{Luminescence\ of\ Stimulated\ Wells\ -\ avg.background}{Avg.Luminescence\ of\ Unstimulated\ Wells\ -\ avg.background}$$

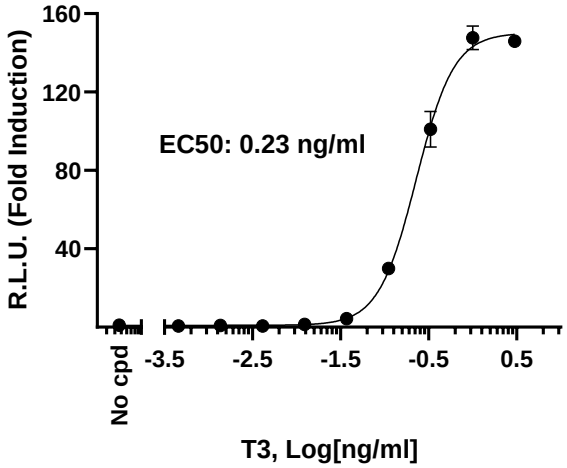

Figure 1. Dose response curve of TRα-GAL4 Luciferase Reporter HEK293 Cell Line to T-3.
TRα-GAL4 Luciferase Reporter HEK293 cells were treated with increasing concentrations of T-3 in a 96-well plate format. Luciferase activity was measured using ONE-Step™ Luciferase Assay System. The results are shown as fold induction of luciferase reporter expression in relation to the activity of cells without treatment (unstimulated control).

Data shown is representative. For lot-specific information, please contact BPS Bioscience, Inc. at support@bpsbioscience.com.

References

Bochukova E., *et al*., 2012 *New England Journal of Medicine* 366(3): 243-249.
Moran C., *et al*., 2015 *Best Pract Res Clin Endocrinol Metab* 29(4):647-57.

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Troubleshooting Guide

Visit bpsbioscience.com/cell-line-faq for detailed troubleshooting instructions. For all further questions, please email support@bpsbioscience.com.

Related Products

Products	*Catalog #*	*Size*
TRβ-GAL4 Luciferase Reporter HEK293 Cell Line	82175	2 vials
GR-GAL4 Luciferase Reporter HEK293 Cell Line	60655	2 vials
Glucocorticoid Receptor (GR)-GAL4 Luciferase Reporter Jurkat Cell Line	78525	2 vials
Transfection Collection™: GAL4 Transient Pack Glucocorticoid Receptor Pathway	79265	100 reactions

Version 080124