293-Dual™ mSTING Cells
(ISG-SEAP/KI-[IFN-β]Lucia)
Dual IRF and IFN-β reporter 293 cells expressing murine STING
Catalog code: 293d-mstg
https://www.invivogen.com/293-dual-msting
For research use only
Version 19K27-MM

PRODUCT INFORMATION

Contents
• 1 vial of 293-Dual™ mSTING (ISG/KI-IFNb) cells (3·7 x 10^6 cells) in a cryovial or shipping flask
IMPORTANT: If cells provided in a cryovial are not frozen upon arrival, contact InvivoGen immediately.
• 1 ml of Blasticidin (10 mg/ml). Store at 4°C or at -20°C.*
• 1 ml of Hygromycin B Gold (100 mg/ml). Store at 4°C or at -20°C.*
• 1 ml of Zeocin™ (100 mg/ml). Store at 4°C or at -20°C.*
• 1 ml of Normocin™ (50 mg/ml). a formulation of 3 antibiotics active against mycoplasmas, bacteria and fungi. Store at -20°C.*
The expiry date is specified on the product label.
• 1 ml of QB reagent and 1 ml of QB buffer (sufficient to prepare 100 ml of QUANTI-Blue™ Solution, a SEAP detection reagent), QB reagent and QB buffer are stable for 1 year at -20°C. QUANTI-Blue™ Solution is stable for 2 weeks at 4°C and for 2 months at -20°C.
• 1 pouch of QUANTI-Luc™. Store at -20°C for 12 months. Reconstituted medium is stable for 1 week at 4°C and 1 month at -20°C. Protect from light.
Note: Data sheets for all components are available on our website.

Handling of Frozen Cells Upon Arrival
Cells must be thawed immediately upon receipt and grown according to handling procedures (as described on the next page) to ensure the best cell viability and proper assay performance.
Note: Avoid freezing cells upon receipt as it may result in irreversible damage to the cell line.
Disclaimer: We cannot guarantee cell viability if the cells are not thawed immediately upon receipt and grown according to handling procedures.
IMPORTANT: For cells that arrive in a shipping flask please refer to the enclosed ‘cell recovery procedure’.

Cell Line Stability
Genetic instability is a biological phenomenon that occurs in all stably transfected cells. Cells will undergo genotypic changes resulting in reduced responsiveness over time in normal cell culture conditions. Therefore, it is critical to prepare an adequate number of frozen stocks at early passages. To ensure maximum efficiency, do not passage 293-Dual™ mSTING (ISG/KI-IFNb) cells more than 20 times.

Quality Control
• Reporter activity has been validated by stimulating the cells with human interferon-β (hIFN-β) and IRF3 activators, such as c-di-AMP and cGAMP.
• The biallelic replacement of the hIFN-β coding sequence with the Lucia luciferase open reading frame (ORF) has been verified by PCR and sequencing.
• The inability to produce IFN-β has been confirmed by ELISA.
• The cell line stability for 20 passages following thawing has been verified.
• The cell line is guaranteed mycoplasma-free.

BACKGROUND

293-Dual™ STING (ISG/KI-IFNb) cells are a family of reporter cells designed to study variants of STING (stimulator of interferon genes; also known as TMEM173, MITA, MPYS, and ERIS). STING is essential for the interferon (IFN) response to cytoplasmic foreign or self-DNA and directly senses cyclic dinucleotides (CDNs), which are important messengers in bacteria and innate immune agonists in mammals. Interestingly, a variety of natural non-synonymous variants of human STING that affect CDN recognition and signal transduction have been identified.

293-Dual™ STING (ISG/KI-IFNb) cells enable the study of STING variation by monitoring the activation of interferon regulatory factor (IRF) and its binding to ISRE (IFN-stimulated response elements) and/or the expression of IFN-β. 293-Dual™ STING (ISG/KI-IFNb) cells were generated from 293-Dual™ Null (ISG/KI-IFNb) cells, which derive from 293 cells, human embryonic kidney 293-derived cells. 293-Dual™ Null (ISG/KI-IFNb) cells do not respond to stimulation by CDNs. 293-Dual™ STING and their parental cell line stably express an ISRE-inducible SEAP (secreted embryonic alkaline phosphatase) reporter construct. They also express Lucia luciferase, a secreted luciferase, placed under the control of the endogenous IFN-β promoter; the coding sequence of IFN-β has been replaced by the Lucia luciferase ORF using knockin technology. Of note, induction of the endogenous IFN promoter is modest as 293 cells are nonimmune cells. In 293-Dual™ STING (ISG/KI-IFNb) cells, CDN stimulation can be assessed by monitoring ISRE-induced SEAP production and/or IFN-β-dependent expression of Lucia luciferase. The two reporter proteins, SEAP and Lucia luciferase, can be readily measured in the supernatant by using QUANTI-Blue™ and QUANTI-Luc™, respectively.

293-Dual™ mSTING (ISG/KI-IFNb) cells were generated from 293-Dual™ Null (ISG/KI-IFNb) cells by stable transfection of the murine STING gene. These cells exhibit a robust response to STING agonists such as 2’3’-cGAMP and 3’3’-cGAMP. In addition, unlike cells with human STING, these cells respond to DMXAA (5,6-Dimethylxanthenone-4-acetic acid) which induces a potent IFN response by activating murine STING.1

293-Dual™ mSTING (ISG/KI-IFNb) cells are resistant to blasticidin, G418, hygromycin and Zeocin™. They should be maintained in growth medium (see next page) supplemented with blasticidin, hygromycin and Zeocin™.


TECHNICAL SUPPORT
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E-mail: info@invivogen.com

FAQ
Any questions about our cell lines?
Visit our FAQ page.

InvivoGen
www.invivogen.com
SAFETY CONSIDERATIONS

Biosafety Level 2
293-Dual™ mSTING (ISG/KI-IFNb) cells were derived from 293 cells (contain adenovirus 5 DNA) and thus may require Biosafety Level 2. The biosafety level varies by country. In the United States, 293 cell lines are designated Biosafety Level 2 according to the Center for Disease Control and Prevention (CDC). In Germany, 293 cell lines are designated Biosafety Level 1 according to the Central Committee of Biological Safety, Zentrale Kommission für die Biologische Sicherheit (ZKBS). Please check with your country’s regulatory authority regarding the use of these cells.

HANDLING PROCEDURES

Required Cell Culture Medium
- Growth Medium: DMEM, 2 mM L-glutamine, 4.5 g/l glucose, 10% (v/v) fetal bovine serum (FBS), Pen-Strep (100 U/ml-100 µg/ml), 100 µg/ml Normocin™
- Freezing Medium: DMEM with 20% (v/v) FBS and 10% (v/v) DMSO
- Test Medium for use with QUANTI-Blue™ Solution: DMEM, 2 mM L-glutamine, 4.5 g/l glucose, 10% (v/v) heat-inactivated FBS (30 min at 56°C), Pen-Strep (100 U/ml-100 µg/ml)

Required Selective Antibiotics
Blasticidin, Hygromycin and Zeocin™

Initial Culture Procedure
The first propagation of cells should be for generating stocks for future use. This ensures the stability and performance of the cells for subsequent experiments.
1. Thaw the vial by gentle agitation in a 37 °C water bath. To reduce the possibility of contamination, keep the O-ring and cap out of the water. Thawing should be rapid.
2. Remove the vial from the water bath as soon as the contents are thawed, and decontaminate by dipping in or spraying with 70% (v/v) ethanol.
3. Transfer cells into a larger vial containing 15 ml of pre-warmed growth medium. Do not add selective antibiotics until the cells have been passaged twice.
4. Centrifuge vial at 1000-1200 RPM (RCF 200-300 g) for 5 minutes.
5. Remove supernatant containing the cryoprotective agent and resuspend cells with 1 ml of growth medium without selective antibiotics.
6. Transfer the vial contents to a 25 cm² tissue culture flask containing 5 ml of growth medium without selective antibiotics.
7. Place the flask containing cells at 37°C in 5% CO2.

Frozen Stock Preparation
1. Resuspend cells at a density of 5-7 x 10^6 cells/ml in freezing medium freshly prepared with cold DMEM.
2. Dispense 1 ml of cell suspension into cryogenic vials.
3. Place vials in a freezing container and store at -80°C overnight.
4. Transfer vials to liquid nitrogen for long term storage.

Cell Maintenance
1. After cells have recovered (after at least one passage), subculture the cells in growth medium supplemented with blasticidin (10 µg/ml), hygromycin (100 µg/ml) and Zeocin™ (100 µg/ml).
2. Renew growth medium twice a week. Cells should be passaged when a 70-80% confluency is reached. Do not let the cells grow to 100% confluency.

Related Products

293-Dual™ mSTING (ISG/KI-IFNb) Cells
- Day 1:
  1. Add 20 µl of each sample per well of a flat-bottom 96-well plate.
  2. Add 20 µl of a positive control such as DMXAA at 30 µg/ml in one well.
  3. Add 20 µl of a negative control such as sterile, endotoxin-free water in another well.
- Day 2:
  1. Prepare QUANTI-Blue™ Solution following the instructions on the enclosed data sheet.
  2. Add 180 µl of resuspended QUANTI-Blue™ Solution per well of a flat-bottom 96-well plate.
  3. Add 20 µl of induced 293-Dual™ mSTING (ISG/KI-IFNb) cell culture supernatant.
  4. Incubate the plate at 37°C incubator for 1-3 h.
  5. Determine SEAP levels using a spectrophotometer at 620-655 nm.

Detection of the ISRE response using QUANTI-Blue™ Solution
Day 2:
1. Prepare QUANTI-Blue™ Solution following the instructions on the enclosed data sheet.
2. Add 180 µl of 293-Dual™ mSTING (ISG/KI-IFNb) cells per ml in test medium (containing 10% v/v heat-inactivated FBS).
3. Add 20 µl of induced 293-Dual™ mSTING (ISG/KI-IFNb) cell culture supernatant.
4. Incubate the plate at 37°C incubator for 1-3 h.
5. Proceed immediately with the measurement.

Use restrictions
These cells are distributed for research purposes only. This product is covered by a Limited Use License. By use of this product, the buyer agrees the terms and conditions of all applicable Limited Use Label Licenses. For non-research use, such as screening, quality control or clinical development, contact info@invivogen.com.
QUANTI-Blue™ Solution
Medium for detection and quantification of alkaline phosphatase in standard and HTS assays
Catalog code: rep-qbs, rep-qbs2
https://www.invivogen.com/quanti-blue

For research use only
Version 19F11-MM

PRODUCT INFORMATION

Contents
QUANTI-Blue™ Solution is available in two pack sizes:
- rep-qbs containing 5 x 1 ml of QB reagent and 5 x 1 ml QB buffer to prepare 500 ml of QUANTI-Blue™ Solution sufficient for 25 x 96-well plates (standard procedure) or 20 x 1536-well plates (HTS screening)
- rep-qbs2 containing 10 x 1 ml of QB reagent and 10 x 1 ml QB buffer to prepare 1 liter of QUANTI-Blue™ Solution sufficient for 50 x 96-well plates (standard procedure) or 40 x 1536-well plates (HTS screening)

Required Material (not provided)
- Sterile water
- Sterile screw cap tube, glass bottle or flask

Storage and Stability
- Store QB reagent and QB buffer at -20°C. Product is stable for 1 year at -20°C when properly stored.
- Reconstituted QUANTI-Blue™ Solution is stable for 2 weeks at 2-8°C and for 2 months at -20°C. Protect QUANTI-Blue™ from light.

Quality Control
Each lot is thoroughly tested to ensure the absence of lot-to-lot variation.
- Physicochemical characterization (including pH, solubility).
- Functional assays using alkaline phosphatase or SEAP-expressing reporter cells.

DESCRIPTION
QUANTI-Blue™ is a colorimetric enzyme assay developed to determine any alkaline phosphatase activity (AP) in a biological sample, such as supernatants of cell cultures. QUANTI-Blue™ Solution changes from pink to a purple-blue color in the presence of AP. Secreted embryonic alkaline phosphatase (SEAP) is a widely used reporter gene. It is a truncated form of placental alkaline phosphatase, a GPI-anchored protein. SEAP is secreted into cell culture supernatant reporter gene. It is a truncated form of placental alkaline phosphatase, Secreted embryonic alkaline phosphatase (SEAP) is a widely used reporter gene. It is a truncated form of placental alkaline phosphatase, a GPI-anchored protein. SEAP is secreted into cell culture supernatant and therefore offers many advantages over intracellular reporters.

FEATURES AND ADVANTAGES
- Requires small samples of cell supernatants - 20 µl is sufficient.
- No need to process samples - Preparation of cell lysates or heating of samples is not required.
- Determine secreted AP activity without disturbing cells - The same cell cultures can be repeatedly sampled for kinetic studies.
- Assay can be completed in 30 min - Hands-on time no longer than 10 min. The enzymatic activity can be detected as early as 15 min after incubation of the samples in QUANTI-Blue™ Solution.
- Wide dynamic range allows to detect low and high levels of AP - No need to perform multiple sample dilutions.
- Highly sensitive for quantitative measurement - Higher saturation threshold than with pNPP (p-nitrophenyl phosphate) resulting in more significant differences between no, low or high AP activity.
- Extremely simple to use - 1) Prepare solution with water, 2) Add sample to detection reagent, 3) Incubate at 37°C, and 4) Assess AP activity.

METHODS
QUANTI-Blue™ Solution has been optimized for use in 96-well plates (standard procedure) and in 1536-well plates (high throughput screening procedure).

A. Standard procedure

1. Prepare 100 ml of QUANTI-Blue™ Solution by adding 1 ml of QB reagent and 1 ml of QB buffer to 1 liter of sterile distilled H₂O.
2. Add 180 µl of QUANTI-Blue™ Solution per well into a 96-well plate.
3. Incubate at 37°C for 15 min to 6 h.
4. Measure OD using a microplate reader.

Figure 1. Standard procedure using QUANTI-Blue™ Solution.

The following protocol refers to the use of 96-well plates. Ensure QB reagent and QB buffer are completely thawed before use.

Note: For fast thawing, QB reagent and QB buffer can be placed at 37°C.

For different cell culture plate formats, please refer to the table below:

<table>
<thead>
<tr>
<th></th>
<th>96-well plate</th>
<th>24-well plate</th>
<th>12-well plate</th>
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<tbody>
<tr>
<td>QUANTI-Blue™</td>
<td>180 µl</td>
<td>450 µl</td>
<td>900 µl</td>
</tr>
<tr>
<td>Supernatant</td>
<td>20 µl</td>
<td>50 µl</td>
<td>100 µl</td>
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TECHNICAL SUPPORT
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B. High Throughput Screening (HTS) procedure

This procedure has been optimized for use in HTS screening procedures in 1536-well plates. QUANTI-Blue™ Solution is added directly to the cell suspension to reduce liquid handling. 

**Note:** For fast thawing, QB reagent and QB buffer can be placed at 37°C for 2 minutes. Ensure heating at 37°C does not exceed 5 minutes.

1. Dispense cell suspension and test compounds into a 1536-well plate in a volume that does not exceed **5 µl** per well. Incubate cells with test compounds for the desired period of time. 
2. Prepare 17 ml of QUANTI-Blue™ Solution by adding 1 ml of QB reagent and 1 ml of QB buffer to 15 ml of sterile water in a 50 ml screw cap tube. 
3. Mix well by vortexing and incubate at room temperature for 10 minutes before use. 
4. Use QUANTI-Blue™ Solution immediately or store at 2-8°C or -20°C. 
5. Dispense **2 µl** of QUANTI-Blue™ Solution to the wells containing ≤5 µl of cell culture in a 1536-well plate. 
6. Mix using a plate shaker. 
7. Incubate at 37°C for 15 min to 6 h. 
8. Measure OD at 620-655 nm. 

**Note:** If the negative control turns purple/blue, it means the fetal bovine serum (FBS) contains alkaline phosphatase. We recommend to heat FBS at 56°C for 30 min to inactivate the alkaline phosphatase activity.

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## RELATED PRODUCTS

<table>
<thead>
<tr>
<th>Product</th>
<th>Catalog Code</th>
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<tr>
<td>pNiFty2-SEAP (Zeo®)</td>
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<td>pSELECT-zeo-SEAP</td>
<td>psetz-seap</td>
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<tr>
<td>HEK-Blue™ Detection</td>
<td>hb-det2</td>
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<tr>
<td>Recombinant SEAP Protein</td>
<td>rec-hsapep</td>
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**Reportor cells**

- HEK-Blue™ hTLR2: hkb-htlr2
- HEK-Blue™ hTLR4: hkb-htlr4
- RAW-Blue™ Cells: raw-sp
- THP1-Blue™ NF-κB Cells: thp-nfk
- THP1-Blue™ ISG Cells: thp-isg

For a complete list of InvivoGen's Reporter Cell Lines visit [https://www.invivogen.com/reporter-cells](https://www.invivogen.com/reporter-cells)
QUANTI-Luc™
A coelenterazine-based luminescence assay reagent
Catalog code: rep-qlc1, rep-qlc2
https://www.invivogen.com/quanti-luc
For research use only
Version 19A04-MM

PRODUCT INFORMATION
Contents
QUANTI-Luc™ is provided as packs of individually sealed pouches.
- rep-qlc1: 2 pouches of QUANTI-Luc™
- rep-qlc2: 5 pouches of QUANTI-Luc™
Each pouch contains everything needed to prepare 25 ml of reagent allowing the preparation of 500 wells of a 96-well plate.

Storage and Stability
- Store QUANTI-Luc™ pouches at -20°C for 12 months.
- Reconstituted QUANTI-Luc™ is stable for 1 week at 4°C and for 1 month at -20°C. Prepare aliquots to avoid repeated freeze-thaw cycles.
Note: This product is photosensitive and should be protected from light.

DESCRIPTION
QUANTI-Luc™ is an assay reagent containing all the components required to quantitively measure the activity of Lucia luciferase and other coelenterazine-utilizing luciferases. QUANTI-Luc™ contains the coelenterazine substrate and stabilizing agents for the luciferase reaction. The light signal produced is quantified using a luminometer and expressed as relative light units (RLU). The signal produced correlates to the amount of luciferase protein expressed, indicating promoter activity in the reporter assay.

QUANTI-Luc™ is optimized for use with Lucia luciferase reporter cell lines. Lucia luciferase is a secreted coelenterazine luciferase encoded by a synthetic gene. As Lucia luciferase is secreted, it can be directly measured in the cell culture medium using bioluminescent assays.

InvivoGen provides a recombinant Lucia luciferase protein (see Related Products) which is a positive control for QUANTI-Luc™. A dilution series of the recombinant Lucia luciferase protein can also be used to determine the linear range of the assay.

METHODS
Preparation of QUANTI-Luc™
1. Pour the pouch contents into a 50 ml screw cap tube.
2. Add 25 ml of sterile water.
3. Swirl product gently until powder is completely dissolved.
4. Use QUANTI-Luc™ assay solution immediately or store until required for use. Reconstituted QUANTI-Luc™ can be stored for 1 week at 4°C and for 1 month at -20°C. Prepare aliquots to avoid repeated freeze-thaw cycles.
Note: This product is photosensitive and should be protected from light.

Detection of luciferase activity from cell culture medium
To obtain end-point readings using a luminometer with an injector.
1. Set the luminometer with the following parameters: 50 µl of injection, end-point measurement with a 4 second start time and 0.1 second reading time.
2. Pipet 10-20 µl of sample per well into a 96-well white (opaque) or black plate, or a luminometer tube.
3. Prime the injector with the QUANTI-Luc™ assay solution and proceed immediately with the measurement.

To obtain end-point readings using a luminometer without injectors.
1. Set the luminometer with a 0.1 second reading time.
2. Pipet 10-20 µl of sample per well into a 96-well white (opaque) or black plate, or a luminometer tube.
3. Add 50 µl of QUANTI-Luc™ assay solution to each well or tube.
4. Gently tap the plate several times to mix (do not vortex).
5. Proceed immediately with the measurement.

RELATED PRODUCTS

<table>
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<th>Product</th>
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<tbody>
<tr>
<td>QUANTI-Luc™ Gold (for standard and HTS assays)</td>
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<tr>
<td>pSelect-zeo-Lucia™ (expression plasmid)</td>
<td>psetz-lucia</td>
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<tr>
<td>Recombinant Lucia luciferase protein</td>
<td>rec-lucia</td>
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<td>Reporter Cells</td>
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<tr>
<td>THP1-Dual™ (IRF-Lucia/NF-κB-SEAP) Cells</td>
<td>thpd-nfs</td>
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<tr>
<td>THP1-Lucia™ NF-κB Cells</td>
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