

TransIT-siQUEST[®] Transfection Reagent

Protocol for MIR 2110, 2114, 2115, 2116



The Transfection Experts

INTRODUCTION

TransIT-siQUEST[®] is a broad spectrum siRNA transfection reagent that enables high efficiency siRNA delivery and knockdown of target gene expression in many cell types including primary cells. Transfections with TransIT-siQUEST do not require medium changes and can be carried out in serum-containing medium. In addition to TransIT-siQUEST, Mirus also offers TransIT-TKO[®] Transfection Reagent for siRNA transfection. Each unique formulation provides high efficiency broad-spectrum siRNA delivery.

SPECIFICATIONS

Storage	Store tightly capped at 4°C. <i>Before each use</i> , warm to room temperature and vortex gently.
Product guarantee	1 year from the date of purchase, when properly stored and handled.



Warm TransIT-siQUEST to room temperature and vortex gently before each use.

MATERIALS

Materials Supplied

TransIT-siQUEST Transfection Reagent is supplied in *one* of the following formats.

Product No.	Quantity
MIR 2114	1 × 0.4 ml
MIR 2110	1 × 1.0 ml
MIR 2115	5 × 1.0 ml
MIR 2116	10 × 1.0 ml

Materials required, but not supplied

- Cultured cells
- Appropriate cell culture medium
- siRNA
- Serum-free medium (e.g., Opti-MEM[®] I Reduced-Serum Medium)
- Sterile tube for transfection complex preparation
- Micropipets
- Reporter assay as required

For Research Use Only.

BEFORE YOU START:

Important Tips for Optimal siRNA Transfection

Optimize reaction conditions for each cell type to ensure successful transfections. The suggestions below yield high efficiency knockdown of target gene expression using *TransIT-siQUEST* Transfection Reagent. Please refer to **Table 1** on Page 3 for recommended starting conditions depending on culture vessel size.

- **Cell density (% confluence) at transfection.** Determine the best cell density for each cell type to maximize transfection efficiency. Passage the cells 18–24 hours before transfection to ensure that the cells are actively dividing and reach appropriate cell density (generally 60–80% confluence) at the time of transfection. If this confluence does not produce optimal results, test cell densities outside of the recommended range.
- **Volume of *TransIT-siQUEST* Reagent.** Each cell type responds differently to a given transfection reagent. As a starting point, test 1.5 µl of *TransIT-siQUEST* Reagent per well of a 24-well plate. For further optimization, test three levels of *TransIT-siQUEST* Reagent, e.g. 0.5 µl, 1.5 µl, and 3 µl per well of a 24-well plate.
- **siRNA dilution.** Dilute siRNA using the manufacturer's recommended buffer. Alternatively, use 100 mM NaCl in 50 mM Tris, pH 7.5, made with RNase-free water. **Do not** use water alone to dilute siRNA, as this may result in denaturation of the siRNA.
- **siRNA concentration.** siRNA used for transfection should be highly pure, sterile, and the correct sequence. Depending on the type of experiment, the final siRNA concentration for transfection is typically within the range of 10–50 nM. As a starting point, we recommend 25 nM siRNA (final concentration in well).
- **Proper controls.** Mirus recommends transfecting a non-targeting or nonsense siRNA control sequence to verify that gene expression knockdown or phenotype is attributed to the gene-specific siRNA. Additionally, targeting a gene with multiple siRNA sequences ensures that the resulting phenotype is not due to off-target effects. .
- **Complex formation conditions.** Prepare *TransIT-siQUEST* Reagent:siRNA complexes in serum-free growth medium. Mirus recommends Opti-MEM I Reduced-Serum Medium.
- **Cell culture conditions:** Culture cells in the appropriate medium, with or without serum. There is no need to perform a medium change to remove the transfection complexes. The *TransIT-siQUEST* Reagent yields improved transfection efficiencies when transfections are performed in complete growth medium (instead of serum-free medium) without a post-transfection medium change.
- **Presence of antibiotics:** Antibiotics will inhibit transfection complex formation and therefore should be excluded from the complex formation step. Transfection complexes can be added to cells grown in complete culture medium containing low levels of antibiotics (0.1–1X final concentration of penicillin/streptomycin mixture).
- **Transfection incubation time.** The optimal incubation time can be determined empirically by testing a range from 24–72 hours post-transfection, depending on the stability of the target mRNA and its encoded protein. When quantifying knockdown efficiencies at the mRNA level, assaying at 24 hours post-transfection is often sufficient. When quantifying knockdown efficiencies at the protein level, longer post-transfection incubation may be necessary particularly if the target protein has a long cellular half-life.



Lower cell densities may be necessary when post-transfection incubation times are greater than 48 hours. If lower cell densities are plated, test a range of *TransIT-siQUEST* reagent to determine the optimal concentration.



Do not use serum or antibiotics in the medium during transfection complex formation.

siRNA TRANSFECTION PROTOCOL

The following procedure describes how to perform siRNA transfection using *TransIT-siQUEST* Transfection Reagent in 24-well plates. The surface areas of other culture vessels are different and transfection must be scaled accordingly. Appropriately increase or decrease the amounts of serum free medium, *TransIT-siQUEST* Reagent, siRNA and complete culture medium based on the surface area of the cell culture vessel (see **Table 1** below).

Table 1: Recommended starting conditions for siRNA transfections with *TransIT-siQUEST* Transfection Reagent.

Culture vessel	96-well plate	48-well plate	24-well plate	12-well plate	6-well plate	10-cm dish	T75 flask
Surface area	0.35 cm ²	1.0 cm ²	1.9 cm ²	3.8 cm ²	9.6 cm ²	59 cm ²	75 cm ²
Complete growth medium (half volume protocol)	44 µl	125 µl	0.25 ml	0.5 ml	1.25 ml	7.5 ml	9.8 ml
Serum-free medium	9 µl	26 µl	50 µl	100 µl	250 µl	1.5 ml	1.9 ml
<i>TransIT-siQUEST</i> Reagent	0.3 µl	0.8 µl	1.5 µl	3 µl	6 µl	46 µl	59 µl
siRNA (1 µM stock) 25 nM final	1.33 µl	3.78 µl	7.5 µl	15 µl	37.5 µl	225 µl	293 µl



This protocol recommends using half the volume of complete growth medium than used in traditional transfection protocols. This ensures maximum siRNA transfection efficiency. If full culture volume is desired, double the volume of complete growth medium and siRNA. Do not double the volume of *TransIT-siQUEST*.



Surface areas are based on Greiner tissue culture plates and Falcon 10-cm dishes and T75 flasks. All volumes given are per well (or per dish) for a given culture vessel.

If small volumes of *TransIT-siQUEST* need to be pipetted, dilute the Reagent in 80% ethanol before each use to avoid pipetting errors. **Do not** store diluted *TransIT-siQUEST* Reagent.

Transient siRNA transfection protocol for cells in 24-well plates

A. Plate cells

1. Approximately 18–24 hours before transfection, plate cells using the following guidelines. Ideally cells should be 60–80% confluent prior to transfection.

For adherent cells: Plate cells in 0.5 ml complete growth medium/well at an optimal concentration (generally $2-6 \times 10^5$ cells/well).

For suspension cells: Plate cells in 0.25 ml of complete growth medium per well, at a density of $8-10 \times 10^5$ cells per well.

2. Incubate the cell cultures overnight.

B. Prepare *TransIT-siQUEST* Reagent:siRNA complexes

(Immediately before transfection)

1. Warm *TransIT-siQUEST* Reagent to room temperature and vortex gently before using.
2. Place 50 µl of Opti-MEM I Reduced-Serum Medium in a sterile tube.
3. Add 1.5 µl of *TransIT-siQUEST* Reagent. Pipet gently to mix completely. For further optimization of your cell type, test additional levels of the *TransIT-siQUEST* Reagent (please refer to “Before You Start” on Page 2).
4. Add 7 µl of a 1 µM siRNA stock solution (25 nM final concentration per well). Pipet gently to mix completely.
5. Incubate at room temperature for 15–30 minutes to allow sufficient time for complexes to form.



Warm *TransIT-siQUEST* to room temperature and vortex gently before each use.

C. Distribute the complexes to cells in complete growth medium

1. **For adherent cells:** Adjust the volume in the well to 0.25 ml of complete growth medium by removing 0.25 ml (half) of the original plating medium. Reducing the volume of medium in each well substantially decreases the amount of siRNA required per well.
For suspension cells: It is not necessary to replace the complete growth medium with fresh medium.
2. Add the *TransIT*-siQUEST Reagent:siRNA complexes (prepared in Step B) drop-wise to different areas of the wells.
3. Gently rock the culture vessel back-and-forth and from side-to-side to evenly distribute the *TransIT*-siQUEST Reagent:siRNA complexes.
4. Incubate for 24–72 hours or as required. It is not necessary to replace the complete growth medium with fresh medium.
5. Harvest cells and assay for knockdown of target gene expression.



There is no need to change fresh culture medium after transfection. If required, perform a medium change at least 4 hours post-transfection.

When quantifying knockdown efficiencies at the mRNA level, assaying at 24 hours post transfection is often sufficient. When quantifying knockdown efficiencies at the protein level, longer post transfection incubation may be necessary, particularly if the target protein has a long cellular half-life.

PLASMID DNA & siRNA SEQUENTIAL TRANSFECTION PROTOCOL

For plasmid DNA transfection, we recommend either *TransIT*®-LT1 (MIR 2300) or *TransIT*®-2020 (MIR 5400) Transfection Reagents. These broad spectrum plasmid DNA transfection reagents can be used to efficiently deliver DNA into a wide variety of cell types. For more information, visit www.mirusbio.com.

The following procedure describes how to perform sequential transfection of plasmid DNA and siRNA transfection using *TransIT*-LT1 and *TransIT* siQUEST. The initial plasmid DNA transfection is recommended in a T75 flask for convenience and reduced well-to-well variability for subsequent siRNA transfection.

The following procedure describes how to perform siRNA transfections in 24-well plates. For other tissue culture formats, please refer to **Table 1** on Page 3.

Transient plasmid DNA and siRNA sequential transfection protocol**A. Plate cells in a T75 flask**

1. **For adherent cells:** Approximately 18–24 hours prior to transfection, plate cells in one T75 flask (for each 24-well plate needed) at an appropriate cell density to obtain 50–70% confluence the following day. Incubate the cell culture overnight.

For suspension cells: Plate cells in a T75 flask the day of transfection to obtain 50–70% cell confluence

B. Prepare *TransIT*-LT1 Reagent:DNA complexes (Immediately before transfection)

1. Warm *TransIT*-LT1 to room temperature and vortex gently before using.
2. Place 500 µL of Opti-MEM I Reduced-Serum Medium in a sterile tube.
3. Add 45 µL *TransIT*-LT1 Reagent. Pipet gently to mix completely.
4. Add 15 µg (15 µl of a 1 µg/µl stock) plasmid DNA. Pipet gently to mix completely.
5. Incubate at room temperature for 15–30 minutes to allow sufficient time for complexes to form.



Divide cultured cells 18–24 hours before transfection such that the cells reach optimal cell density at the time of transfection.



Warm *TransIT*-LT1 to room temperature and vortex gently before each use.



For optimization of plasmid DNA transfection, follow the guidelines as per *TransIT*-LT1 (MIR2300) user protocol.

C. Distribute the TransIT-LT1: DNA complexes to cells in complete growth medium

1. Add the *TransIT-LT1* Reagent:DNA complexes (prepared in Step B) drop-wise to cells in complete growth medium. It is not necessary to replace the complete growth medium with fresh medium.
2. Gently rock the culture vessel back-and-forth and from side-to-side to evenly distribute the *TransIT-LT1* Reagent:DNA complexes.
3. Incubate for 2–4 hours.

D. Transfer cells from T75 flask to 24-well plates

1. Trypsinize the T75 flask according to standard procedures.

For adherent cells: Add 13–14 ml of complete growth medium to the T75 flask.

Mix cells thoroughly and plate 500 μ l per well of a 24-well plate (adherent cells) to obtain 60–80% confluence at the time of transfection.

For suspension cells: Transfer 250 μ l of suspension cells to obtain a cell density of 3–5 $\times 10^5$ cells per well of a 24-well plate. Transfection reagents can cause suspension cells to adhere; therefore, ensure cells are completely removed from the bottom of the flask.

2. Incubate for 2 hours.

E. Prepare TransIT-siQUEST:siRNA complexes**(Immediately before transfection)**

1. Warm *TransIT-siQUEST* Reagent to room temperature and vortex gently before using.
2. Place 50 μ l of Opti-MEM1 Reduced-Serum Medium in a sterile tube.
3. Add 1.5 μ l of *TransIT-siQUEST* Reagent. Pipet gently to mix completely. For further optimization of your cell type, test additional levels of the *TransIT-siQUEST* Reagent (please refer to “Before You Start” on Page 2).
4. Add 7 μ l of a 1 μ M siRNA stock solution (25 nM final concentration per well). Pipet gently to mix completely.
5. Incubate at room temperature for 15–30 minutes to allow sufficient time for complexes to form.

F. Distribute the TransIT-siQUEST:siRNA complexes to cells in complete growth medium

1. **For adherent cells:** Adjust the volume in the well to 0.25 ml of complete growth medium by removing 0.25 ml (half) of the original plating medium. This medium reduction requires the use of less siRNA to obtain the recommended 25 nM (final concentration in the well).

For suspension cells: It is not necessary to replace the complete growth medium with fresh medium.

2. Add the transfection complexes (prepared in Step B) drop-wise to different areas of the wells containing plated cells.
3. Gently rock the culture vessel back-and-forth and from side-to-side to evenly distribute the transfection complexes.
4. Incubate for 24–72 hours or as required. It is not necessary to replace the complete growth medium with fresh medium.
5. Harvest cells and assay for expression and/or knockdown of target gene expression.



There is no need to change fresh culture medium after transfection. If required, perform a medium change at least 4 hours post-transfection.

When quantifying knockdown efficiencies at the mRNA level, assaying at 24 hours post transfection is often sufficient. When quantifying knockdown efficiencies at the protein level, longer post transfection incubation may be necessary if the target protein has a long cellular half-life.

TROUBLESHOOTING GUIDE

Problem	Solution
POOR siRNA KNOCKDOWN EFFICIENCY	
TransIT-siQUEST Reagent was not mixed properly.	Warm <i>TransIT-siQUEST</i> to room temperature and vortex gently before each use.
Suboptimal <i>TransIT-siQUEST</i> Reagent:siRNA ratio	For optimization, test three levels of <i>TransIT-siQUEST</i> Reagent, e.g. 0.5, 1.5, and 3 µl per well of a 24-well plate, using 25 nM siRNA (final concentration in the well). Additional levels may need to be titrated depending on the cell type.
Suboptimal siRNA concentration	Determine the optimal siRNA concentration by titrating from 10–50 nM (final concentration in the well). We recommend starting with 25 nM siRNA (final concentration in the well). In some instances, higher concentrations of siRNA up to 100 nM may be necessary to achieve sufficient knockdown of the gene of interest. Please refer to “Before You Start” on page 4.
Proper controls were not included	<ol style="list-style-type: none"> 1. Serum-free medium alone 2. Serum-free medium + <i>TransIT-siQUEST</i> Reagent + a non-targeting siRNA To verify efficient transfection and knockdown, use <i>TransIT-siQUEST</i> Reagent to deliver a siRNA targeted against a ubiquitous gene, e.g. GAPDH or Lamin A/C, followed by target western blotting or mRNA quantification.
Denatured siRNA	To assess delivery efficiency of siRNA, use Mirus’ <i>Label IT®</i> siRNA Tracker™ Intracellular Localization Kits or a pre-labeled <i>Label IT</i> RNAi Delivery Control (please refer to Related Products on Page 8)
Denatured siRNA	To dilute siRNA, use the manufacturer’s recommended buffer or 100 mM NaCl, 50 mM Tris, pH 7.5 in RNase-free water. Do not use water as this can denature the siRNA at low concentration during long-term storage.
Incorrect siRNA Sequence	Ensure that the sequence of the siRNA is correct for the gene of interest. More than one sequence is recommended for optimal knockdown efficiency and to ensure on-target effects.
Poor quality of siRNA	Avoid siRNA degradation by using RNase-free handling procedures and plastic ware. Degradation of siRNA can be detected on acrylamide gels.
Inhibitor present during transfection	Serum and antibiotics inhibit transfection complex formation. Prepare <i>TransIT-siQUEST</i> Reagent:DNA complexes in serum-free growth medium. We recommend Opti-MEM I Reduced-Serum Medium. Once transfection complexes are formed, they can be added directly to cells cultured in complete growth medium containing serum and 0.1–1X antibiotics.
Transfection incubation time	Polyanions e.g. dextran sulfate or heparin can inhibit transfection. Use culture medium that does not contain these polyanions. If necessary, the transfection medium can be replaced with polyanion containing medium 24 hours post transfection.
Transfection incubation time	Determine the optimal transfection incubation time for each cell type and experiment. Test a range of incubation times (e.g. 24–72 hours). When quantifying knockdown efficiencies at the mRNA level, assaying at 24 hours post transfection is often sufficient. When quantifying knockdown efficiencies at the protein level, longer post transfection incubation may be necessary if the target protein has a long cellular half-life.
Cell-type dependence	Some cell types might exhibit better knockdown efficiencies with an alternative siRNA delivery reagent from Mirus: <i>TransIT-TKO</i> Transfection Reagent. Mirus Bio offers the <i>TransIT-siPAK</i> Trial Kit which contains samples of both the <i>TransIT-siQUEST</i> and <i>TransIT-TKO</i> Transfection Reagents.

TROUBLESHOOTING GUIDE continued

Problem	Solution
HIGH CELLULAR TOXICITY	
Transfection complexes and cells not mixed thoroughly after complex addition	Add transfection complexes drop-wise to the cells. Gently rock the dish back-and-forth and from side-to-side to distribute the complexes evenly. Do not swirl or rotate the dish, as this may cause uneven distribution.
Transfection complexes added to cells cultured in serum-free medium	<i>TransIT-siQUEST</i> efficiently transfects cells cultured in serum-free medium; however, toxicity may be higher if serum is not present. If toxicity is a problem, consider adding serum to the culture medium.
Medium change or addition may be necessary	If incubating for 48–72 hours, it may be necessary to change the complete medium 24 hours post-transfection. Alternatively, add additional complete medium 4–24 hours post-transfection.
Knockdown of an essential gene	If the siRNA is directed against a gene that is essential to the cell, cytotoxicity may be observed due to knockdown of the target gene. Include a transfection control with non-targeting siRNA to compare the cytotoxic effects of the gene being knocked down.
Cell density not optimal at time of transfection	Determine optimal cell density for each cell type to maximize transfection efficiency. Use this density to ensure reproducibility. For most cell types, 60–80% confluence is recommended at transfection, but use of higher or lower densities may increase cell viability depending on cell type.
Cell morphology has changed	Mycoplasma contamination can alter cell morphology and affect transfection efficiency. Check your cells for Mycoplasma contamination. Use a fresh frozen stock of cells or use appropriate antibiotics to eliminate Mycoplasma. A high or low cell passage number can make cells more sensitive and refractory to transfection. Maintain a similar passage number between experiments to ensure reproducibility.

RELATED PRODUCTS

- Ingenio™ Electroporation Solution and Kits
- *Label IT* Plasmid Delivery Controls
- *Label IT* RNAi Delivery Controls
- *Label IT* siRNA Tracker Intracellular Localization Kits
- *TransIT-PRO™* Transfection Kit
- *TransIT-2020* Transfection Reagent
- *TransIT* Cell Line Specific Transfection Reagents and Kits
- *TransIT-InVivo* Gene Delivery Kits
- *TransIT* LT1 Transfection Reagent
- *TransIT-QR* and *TransIT-EE* Delivery Solutions and Kits
- *TransIT-siPAK* Kit
- *TransIT-siPAK* Plus Kit
- *TransIT-TKO* Transfection Reagent

For details on the above mentioned products, visit www.mirusbio.com or www.TheTransfectionExperts.com

Contact Mirus Bio for additional information.



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