

Introduction

The delivery of foreign DNA into eukaryotic cells is one of the most common molecular biology techniques to study biological mechanisms. However, unlike transformed cell lines, the efficient transfection of primary cells can be a problem. MesenFectagen is a cationic polymer-based transfection system specifically designed and optimized for efficient transfection of primary mesenchymal stem cells. Transfection with MesenFectagen can be carried out in the presence of antibiotics and serum. Instead of normal two-day transfection, an optimized one-day transfection procedure can be performed for time-saving and highly reproducible transfection. One ml of MesenFectagen reagent is sufficient for up to 250 transfections per well in 96-well plate.

Storage/Handling

Upon receipt, aliquot and store MesenFectagen reagent A at -20°C, avoid repeated freezing/thawing cycles. Once thawed, store MesenFectagen reagent A at 4°C and use in a month. MesenFectagen reagent B can be kept at 4°C.

Quality Control

Each lot of MesenFectagen is performance tested by transfecting Human Mesenchymal Stem Cells (HMSCs, Cat. No. 7500, ScienCellTM) with Promega[®] pSV-bata-Galactosidase control vector. Gene expression is assayed by X-gal staining 24 hours post transfection. Typically, 20-35% transfection efficiency can be achieved (Figure 1).

Procedures for Transfecting Adherent Cells in 96-well Plate*

A. Preparation of cells

1. On the day of transfection, coat 96-well plate with poly-L-lysine at 2 µg/cm². Incubate at 37°C for 2-4 hours. Rinse the poly-L-lysine coated wells with sterile deionized H₂O twice before seeding of cells. The pre-coating of poly-L-lysine ensures good and even cell adhesion.
2. Select a flask of mesenchymal stem cells with 60-80% confluency, harvest and dilute cells in Mesenchymal Stem Cell Culture Medium to give a final concentration of ~1.1×10⁵ cells/ml.

B. Transfection complex formation

1. Prepare plasmid DNA in sterile deionized H₂O to give a final concentration of 1 µg/µl. To achieve successful transfection, high quality DNA with OD₂₆₀/OD₂₈₀ of 1.8 or greater is recommended.
2. For each well, add 0.5 µl plasmid DNA, 10.5 µl sterile deionized H₂O and 5 µl MesenFectagen reagent B into a 1.5 ml sterile plastic tube. Vortex gently and spin down briefly. Then add 4 µl MesenFectagen reagent A to make the total volume of the transfection mixture to be 20 µl, vortex for 5 seconds and spin down. Incubate at room temperature for 20-30 min.

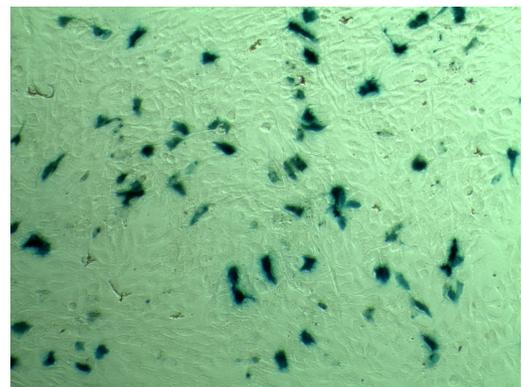


Figure 1. HMSCs expressing β-galactosidase after transfection using MesenFectagen.

C. Incubation of cells with transfection mixture

1. Plate 180 μ l of cell suspension ($\sim 1.1 \times 10^5$ cells/ml) in each well to give $\sim 2 \times 10^4$ cells per well.
2. Add 20 μ l of transfection mixture to each well. Mix by gently rocking the plate side-to-side.
3. Perform a medium change after 4-6 hours' incubation with transfection mixtures, replace with 200 μ l fresh culture medium, and culture for additional 16-18 hours.
4. Harvest cells 24 hours post transfection and assay for gene expression.

* The amounts of cells and various transfection reagents mentioned in the instruction are recommended for performing transfection in 96-well plate. For transfection in larger size wells, the amounts of mesenchymal stem cells and transfection reagents (DNA, sterile deionized H₂O and MesenFectagen reagents A&B) should be scaled up according to the surface area of the wells (Table 1).

Table 1. Recommended quantities of mesenchymal stem cells and MesenFectagen reagents per well.

Culture Vessel	Growth Area (cm ² /well)	# of cells	1 μ g/ μ l DNA stock (μ l)	Sterile DI H ₂ O (μ l)	MesenFectagen reagent B (μ l)	MesenFectagen reagent A (μ l)	MSCM (μ l)
96-well plate	0.35	20,000	0.5	10.5	5	4	180
48-well plate	0.8	45,000	1.1	24	11.4	9.1	411
24well plate	2.0	115,000	2.9	60	29	23	1029
12-well plate	4.0	230,000	5.7	120	57	46	2057
6-well plate	9.6	550,000	13.7	288	137	110	4937