MITOCHONDRIA ISOLATION KIT for Cultured Cells

Number Description
89874 Mitochondria Isolation Kit for Cultured Cells, contains sufficient reagents to isolate intact mitochondria from 50 pellets of cultured mammalian cells containing \(2 \times 10^7\) cells each

Kit Contents:
- Mitochondria Isolation Reagent A, 50mL
- Mitochondria Isolation Reagent B, 500µL
- Mitochondria Isolation Reagent C, 65mL

Storage: Upon receipt store kit at 4°C. Product is shipped at ambient temperature.

Introduction

The Thermo Scientific Mitochondria Isolation Kit for Cultured Cells enables isolation of intact mitochondria from cultured mammalian cells. The kit offers two options for the separation of mitochondria from cytosolic components (Figure 1). One option is a unique protocol utilizing a reagent-based method allowing multiple samples to be processed concurrently. The second option uses traditional Dounce homogenization and provides approximately two-fold more mitochondria, based on protein analysis. Both protocols rely on differential centrifugation to separate the mitochondrial and cytosolic fractions with a bench-top microcentrifuge and are completed in approximately 40 minutes (post-cell harvest). Each procedure has been optimized for maximum yield of mitochondria with minimal damage to integrity. Once isolated, the mitochondria may be used for a number of downstream applications, including apoptosis, signal transduction and metabolic studies.

Option A
- Add 800 µL Reagent A to cells (20 x 10^6)
- Incubate 2 minutes on ice
- Add 10 µL Reagent B. Incubate 5 minutes on ice, vortexing every minute

Option B
- Dounce homogenize
- Add 800 µL Reagent C
- Centrifuge at 700 x g for 10 minutes at 4°C
- Collect supernatant and centrifuge at 12,000 x g for 15 minutes at 4°C

*To obtain a more purified preparation of mitochondria, this step may be performed at 3,000 x g.

Figure 1. Procedure summary of the Pierce Mitochondria Isolation Kit.

Important Product Information

- This kit allows two options for mitochondria isolation: a reagent-based method or Dounce homogenization. The kit contains sufficient reagents for a total of 50 applications using either method exclusively or a combination of both.
- Up to six samples may be processed concurrently using the reagent-based isolation method, whereas only one sample may be processed at a time with the Dounce isolation method. Because of the time delay in processing multiple samples with the Dounce protocol, samples processed initially may yield a higher quantity of mitochondria than cell pellets incubated on ice for subsequent isolation.
The protocols presented prepare a crude mitochondrial fraction that includes lysosomal and peroxisomal contaminants. To obtain a more purified fraction of heavy mitochondria, centrifuge the post-nuclear supernatant at 3,000 × g instead of at 12,000 × g. Western blot analysis of purified versus crude mitochondrial fractions prepared with this kit result in a > 50% reduction in cathepsin S (lysosomal protein) and PMP70 (peroxisomal protein) in the purified fraction.

Additional Materials Required
- Variable-speed bench-top microcentrifuge (refrigerated)
- 2.0mL microcentrifuge tubes
- Vortex mixer
- Protease inhibitors, EDTA-free such as Halt™ Protease Inhibitor Cocktail Kit (Product No. 78415)
- Dounce tissue grinder, such as 2mL Kontes or Wheaton Dounce Tissue Grinder, if using Option B

Option A: Isolation of Mitochondria using Reagent-based Method

Notes:
- Immediately before use, add protease inhibitors to Reagent A and Reagent C; only add inhibitors to the reagent amount being used for the procedure and not to the stock solutions.
- Process up to six samples concurrently.
- Required speed of vortex changes during the protocol.

1. Pellet 2 × 10⁷ cells by centrifuging harvested cell suspension in a 2.0mL microcentrifuge tube at ~850 × g for 2 minutes. Carefully remove and discard the supernatant.
2. Add 800µL of Mitochondria Isolation Reagent A. Vortex at medium speed for 5 seconds and incubate tube on ice for exactly 2 minutes.
   Note: Do not exceed the 2 minute incubation.
3. Add 10µL of Mitochondria Isolation Reagent B. Vortex at maximum speed for 5 seconds.
4. Incubate tube on ice for 5 minutes, vortexing at maximum speed every minute.
5. Add 800µL of Mitochondria Isolation Reagent C. Invert tube several times to mix (do not vortex).
6. Centrifuge tube at 700 × g for 10 minutes at 4°C.
7. Transfer the supernatant to a new, 2.0mL tube and centrifuge at 12,000 × g for 15 minutes at 4°C.
   Note: To obtain a more purified fraction of mitochondria, with > 50% reduction of lysosomal and peroxisomal contaminants, centrifuge at 3,000 × g for 15 minutes.
8. Transfer the supernatant (cytosol fraction) to a new tube. The pellet contains the isolated mitochondria.
9. Add 500µL Mitochondria Isolation Reagent C to the pellet, and centrifuge at 12,000 × g for 5 minutes. Discard the supernatant.
10. Maintain the mitochondrial pellet on ice before downstream processing. Freezing and thawing may compromise mitochondria integrity.

Option B: Isolation of Mitochondria using Dounce Homogenization

Notes:
- Immediately before use, add protease inhibitors to Reagent A and Reagent C; only add inhibitors to the reagent amount being used for the procedure and not to the stock solutions.
- Process one sample at a time.
- Pre-chill Dounce Tissue Grinder on ice before use.
1. Pellet $2 \times 10^7$ cells by centrifuging harvested cell suspension in a 2.0mL microcentrifuge tube at ~850 × g for 2 minutes. Carefully remove and discard the supernatant.

2. Add 800µL of Mitochondria Isolation Reagent A. Vortex at medium speed for 5 seconds and incubate tube on ice for exactly 2 minutes.
   
   **Note:** Do not exceed the 2 minute incubation.

3. Transfer cell suspension to Dounce Tissue Grinder.

4. Homogenize cells on ice. Perform enough strokes to effectively lyse the cells.
   
   **Note:** See Additional Information Section for the number of strokes required for > 80% lysis of a select group of cell types.

   **Note:** To check the cell lysis efficiency, spot 5µL of cell lysate onto a glass slide, add coverslip and view under a microscope. Compare with 5µL of the nonlysed cells.

5. Return lysed cells to original tube and add 800µL of Mitochondria Isolation Reagent C.

6. Rinse Dounce Tissue Grinder with 200µL of Mitochondria Isolation Reagent A and add to tube containing the sample in step B.5.

7. Invert tube several times to mix (do not vortex).

8. Centrifuge tube at 700 × g for 10 minutes at 4°C.

9. Transfer the supernatant to a new, 2.0mL tube and centrifuge at 12,000 × g for 15 minutes at 4°C.

   **Note:** To obtain a more purified fraction of mitochondria, with > 50% reduction of lysosomal and peroxisomal contaminants, centrifuge at 3,000 × g for 15 minutes.

10. Transfer the supernatant (cytosol fraction) to a new tube. The pellet contains the isolated mitochondria.

11. Add 500µL Mitochondria Isolation Reagent C to the pellet, and centrifuge at 12,000 × g for 5 minutes. Discard the supernatant.

12. Maintain the mitochondrial pellet on ice before downstream processing. Freezing and thawing may compromise mitochondria integrity.

### Additional Information

**A. Cell Lysis**

The number of Dounce homogenization strokes necessary for optimal cell lysis will vary depending upon cell line. The number of strokes required for > 80% lysis of a select group of cell types is indicated in Table 1, which may be used as a guide for other cell lines.

**Table 1.** Number of strokes required to achieve ~80% lysis efficiency using Dounce homogenization.*

<table>
<thead>
<tr>
<th>Cell Line</th>
<th>Number of strokes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C6</td>
<td>40</td>
</tr>
<tr>
<td>HeLa</td>
<td>60</td>
</tr>
<tr>
<td>NIH 3T3</td>
<td>80</td>
</tr>
</tbody>
</table>

* Lysis efficiency was determined by visual estimation using a microscope.

**B. Mitochondria Lysis**

For analysis by Western blotting or gel electrophoresis, boil mitochondrial pellet with SDS-PAGE sample buffer and apply to the gel. For protein analysis using Pierce BCA Protein Assay Kit (Product No. 23225), mitochondria may be lysed with 2% CHAPS in Tris buffered saline (TBS; e.g., 25 mM Tris, 0.15 M NaCl; pH 7.2; Product No. 28379) as described below:

1. Add 100µL of 2% CHAPS in TBS to the mitochondrial pellet and vortex for 1 minute.

2. Centrifuge mitochondria at high speed for 2 minutes. The supernatant contains soluble mitochondrial protein that can be analyzed by Pierce BCA Protein Assay.
Related Thermo Scientific Products

89801  Mitochondria Isolation Kit for Tissue, contains sufficient reagents to perform 50 isolations of intact mitochondria from soft and hard tissues

23225  Pierce BCA Protein Assay Kit, sufficient reagents to perform 500 standard tube assays or 5,000 microplate assays

34080  SuperSignal® West Pico Chemiluminescent Substrate, 500mL

78415  Halt™ Protease Inhibitor Cocktail, EDTA-Free, sufficient reagents for 100mL of extract

78833  NE-PER® Nuclear and Cytoplasmic Extraction Kit, sufficient reagents for extracting 50 cell pellet fractions having packed cell volumes of 20µL each

89826  Mem-PER® Eukaryotic Membrane Protein Extraction Kit, sufficient reagents for extracting 50 cell pellet fractions of $5 \times 10^6$ cells each

References for Apoptosis


References for Mitochondrial Proteome


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