

## User Bulletin

### Total RNA Extraction Maxiprep System

Viogene Total RNA Extraction Maxiprep System provides an economical method to purify total RNA from various samples such as cultured cells, tissues, and bacteria. A simple silica-membrane spin-column method can isolate total RNA without need of performing time-consuming phenol/chloroform extraction and ethanol precipitation. Total RNA longer than 200 nucleotides are isolated, while small RNA such as 5.8S RNA, 5S RNA, and tRNA, which make up 15-20% of the total RNA, are excluded.

### Downstream Application

- \* Northern blotting
- \* Ploy A<sup>+</sup> RNA selection
- \* cDNA synthesis
- \* RT-PCR

### Product Contents

Cat. No	GRM1001	GRM1002
Preps	6	24
RX Buffer	220ml	220ml x 4
WF Buffer (RNA)	108ml	216ml x 2
WS Buffer (RNA)	25ml	45ml x 2
RNase-free ddH <sub>2</sub> O	18ml	72ml
Total RNA Maxi Column	6	24
Protocol	1	1

**All buffers need to be mixed well before use.**

### Shipping & Storage

Viogene Total RNA Extraction Maxiprep is shipping and storage at ambient temperature up to 12 months.

If precipitate form by freezing temperature on any buffer, warm up at 37°C to redissolve.

### Protocol:

❖ **Please read the following notes before starting the procedures.**

### Sample preparation:

Since the binding capacity of the Total RNA Maxi Column is 10 mg of total RNA, in order to avoid exceeding the binding capacity, use the sample preparation guide listed in Table 1.

**Table 1. Sample preparation guide**

Sample	Recommended amount of sample		Yield (mg)
Animal cells	NIH-3T3	5 x 10 <sup>8</sup> cells	6
	HeLa	4 x 10 <sup>8</sup> cells	5
	COS-7	2 x 10 <sup>8</sup> cells	5
	LMH	5 x 10 <sup>8</sup> cells	5
Animal tissues	Mouse/rat tissues		
	Embryo	500 mg	1.5
	Heart	500 mg	0.5
	Brain	500 mg	0.5
	Kidney	500 mg	1.5
	Liver	500 mg	2.5
	Spleen	500 mg	1.5
	Lung	500 mg	0.5
	Thymus	500 mg	2.5
	Bacteria	<i>E. coli</i>	5 x 10 <sup>10</sup> cells
<i>B. subtilis</i>		5 x 10 <sup>10</sup> cells	2

- **WARNING**, strong acids and oxidants (like for instance bleach) should not be used together with RX buffer (because this kind of reaction would produce cyanide)!!!

## Important Notes

- Add 100 ml (for GRM1001) or 180ml (for GRM1002) of 98-100% ethanol into WS Buffer bottle when first open.
- All plasticware and containers should be treated properly to make sure RNase-free. Gloves should be worn when handling RNA.
- Buffers provided in this system contain irritants. Appropriate safety apparels such as gloves and lab coat should be worn.
- All centrifugation steps except cell pelleting are done at 2,500 x g (about 3,000 rpm) in a swing-bucket centrifuge.
- Some genomic DNA (and plasmid DNA, if any) will also be copurified with RNA. DNase treatment is therefore required when DNA-free RNA is desired. DNase can then be removed by phenol/chloroform extraction (refer to Protocol for "[Removal of genomic DNA in eluted total RNA by DNase](#)").
- Pipet a required volume of RX Buffer into another tube and add 10  $\mu$ l  $\beta$ -mercaptoethanol ( $\beta$ -ME) per 1 ml RX Buffer before use.
- Complete disruption and homogenization of sample is essential for total RNA extraction.

## Animal Tissue Protocol:

- 1. Add 17.5 ml RX Buffer ( $\beta$ -ME added) to 500 mg of liquid-nitrogen-frozen or fresh tissue. Disrupt and homogenize the sample by grinding and shearing using 20-G needle syringe.**  
Add 10  $\mu$ l  $\beta$ -mercaptoethanol ( $\beta$ -ME) per 1 ml of RX Buffer.
- 2. Centrifuge the lysate for 5 minutes to spin down insoluble materials and use only the supernatant in the following steps.**
- 3. Determine the final volume of the supernatant. Add an equal volume of 70% ethanol to the clear lysate and mix by vortexing.**  
If lysate is lost during the preparation, reduce the volume of ethanol accordingly. Do not centrifuge the ethanol added lysate.
- 4. Place a Total RNA Maxi Column onto a 50 ml Collection Tube. Add 15 ml of the ethanol-added sample (including any precipitate) into the column. Centrifuge for 3 minutes. Discard the flow-through.**  
Repeat this step for the rest of the sample. If some sample still retains in the column, repeat centrifugation until all sample pass the column.
- 5. Wash the column once with 15 ml WF Buffer by centrifuging for 30-60 seconds. Discard the flow-through.**
- 6. Wash the column once with 15 ml WS Buffer by centrifuging for 30-60 seconds. Discard the flow-through.**  
Add 100 ml (for GRM1001) or 180ml (for GRM1002) of 98-100% ethanol into WS Buffer bottle when first open.
- 7. Centrifuge the column for another 5 minutes to remove ethanol residue.**

**8. Place the column onto a new 50 ml Tube. Add 2.5 ml RNase-free ddH<sub>2</sub>O (provided) onto the center of the membrane.**

For effective elution, make sure that the elution solution is dispensed onto the center of the membrane.

**9. Stand the column for 2 minute, and centrifuge for 5 minutes to elute total RNA.**

**10. Store RNA at -70 °C.**

**Animal Cells Protocol:**

**1. Pellet 2 x 10<sup>8</sup> – 5 x 10<sup>8</sup> cells by centrifuging at 300 x g for 5 minutes to pellet cells. Remove all the supernatant.**

**2. Disrupt cells by adding 17.5 ml (2 x 10<sup>8</sup> cells), 35 ml (5 x 10<sup>8</sup> cells) of RX Buffer (β-ME added) to the cell pellet and vortex the sample. Homogenize the sample by using 20-G needle syringe.**

Add 10 μl β-mercaptoethanol (β-ME) per 1 ml of RX Buffer.

**3. Follow the Animal Tissue Protocol starting from Step 2.**

**Animal Cell Cytoplasm Protocol:**

**1. Prepare cytoplasm lysate.**

Prepare cell lysis buffer: (provide by user) 20 mM Tris-HCl pH 8.0, 1 mM MgCl<sub>2</sub>, 0.5% NP-40. Keep at 4 °C .

Only fresh cells are used for preparing cytoplasm lysate.

**a. Harvest 2 x 10<sup>8</sup> - 5 x 10<sup>8</sup> cells and centrifuge at 300 x g to pellet cells.**

**b. Add 9 ml of cell lysis buffer to the cell pellet, resuspend and lysis cells by gentle pipetting. Incubate the lysate on ice for 5 minutes.**

**c. Centrifuge the lysate at 300 x g at 4°C for 3 minutes, transfer the supernatant to a new tube, and use the supernatant (lysate) in the following steps.**

**2. Add 30 ml of RX Buffer (β-ME added) to the lysate and mix by vortexing.**

Add 10 μl β-mercaptoethanol (β-ME) per 1 ml of RX Buffer.

**3. Add 22.5 ml of 98-100% ethanol to the sample and mix by vortexing.**

**4. Follow the Animal Tissue Protocol starting from Step 4.**

**Bacteria Protocol:**

**1. Pellet up to 5 x 10<sup>10</sup> bacterial cells by centrifuging at 2,500 x g (3,000 rpm) for 5 minutes. Remove all the supernatant.**

**2. Resuspend cells in 5 ml of TE buffer by vortexing.**

**3. Add lysozyme (provide by user) to a final concentration of 500 μg/ml for Gram-negative bacteria; 2 mg/ml for Gram-positive bacteria, and incubate at room temperature for 10 minutes.**

**4. Add 17.5 ml RX Buffer (β-ME added) to the sample and mix by vortexing.**

Add 10 μl β-mercaptoethanol (β-ME) per 1 ml of Buffer RX.

5. Centrifuge lysate for 5 minutes to spin down insoluble materials and use only the supernatant in the following steps.
6. Add 12.5 ml of 98-100% ethanol to the sample and mix by vortexing.
7. Follow the Animal Tissue Protocol starting from Step 4.

#### Removal of genomic DNA in eluted total RNA by DNase

1. Incubate total RNA with RNase-free DNase I (1 unit per  $\mu\text{g}$  of total RNA) in 50 mM Tris-HCl (pH 7.5), 10 mM  $\text{MnCl}_2$ , and 50  $\mu\text{g}/\text{ml}$  BSA at 37 °C for 15-30 minutes.
2. Remove DNase I by adding an equal volume of phenol:chloroform (1:1) and mix well. Centrifuge for 5 minutes. Transfer the upper aqueous layer to a new eppendorf tube.
3. Add 1/10 volume of 3 M sodium acetate (pH 5.2) and 1 volume of ice-cold isopropanol to the solution and mix well. Chill on ice for 30 minutes.
4. Centrifuge for 10 minutes at 4°C. Discard the supernatant. Wash the pellet twice with 1 ml of 70 % ethanol and recentrifuge.
5. Remove all supernatant. Air dry the RNA pellet. Redissolve RNA in RNase-free ddH<sub>2</sub>O.

## Troubleshooting

### Little or no RNA eluted:

#### a. Insufficient disruption or homogenization

Reduce the amount of starting sample and perform more disruption and homogenization.

#### b. Clogged Total RNA column

Reduce the amount of starting sample and perform more disruption and homogenization. Centrifuge the lysate to remove insoluble materials and use the supernatant only.

#### c. RNA is degraded

Starting sample should be fresh or frozen in liquid nitrogen and store at -80 °C. Improper handling of the sample or storing the sample at -20 °C will cause RNA degradation.

#### d. RNase contamination

Use RNase-free liquid, handling tips and tubes.

### DNA contamination:

Refer to Protocol for "[Removal of genomic DNA in eluted total RNA by DNase](#)"

### $A_{260}/A_{280}$ ratio of eluted total RNA is low:

#### a. Use ddH<sub>2</sub>O of acidic pH to dilute RNA sample for spectrophotometric analysis

Use 10 mM Tris-HCl of pH 7.5 or TE buffer to dilute RNA sample.

#### b. DNA is copurified with RNA

Refer to Protocol for "[Removal of genomic DNA in eluted total RNA by DNase](#)".