

For isolation RNA from human whole blood, animal cells, animal tissues (fresh, frozen) paraffin fixed sample, bacteria, yeast, fungi and for RNA clean-up

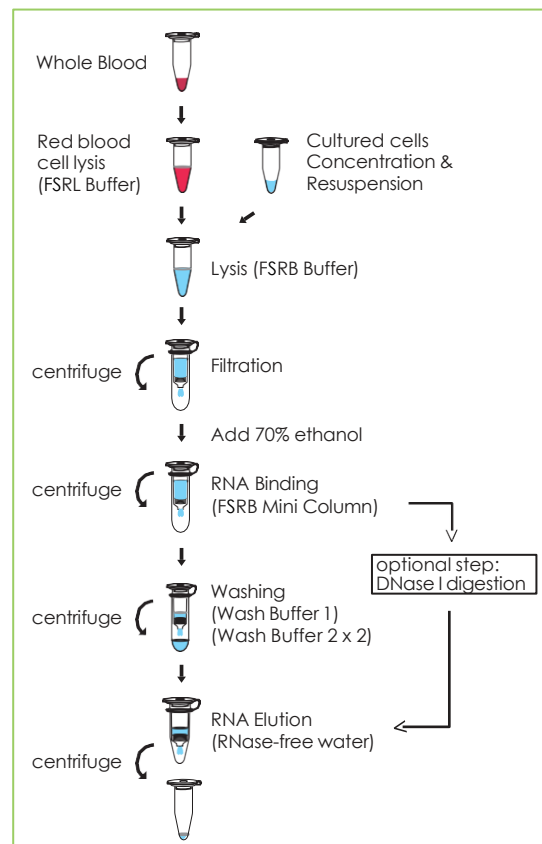
| KIT Components                                                                      | RE-003s<br>SAMPLE | RE-004<br>100 PREPS |
|-------------------------------------------------------------------------------------|-------------------|---------------------|
| FSRL Buffer                                                                         | 15 ml             | 240 ml              |
| FSRB Buffer                                                                         | 1,5 ml x 2        | 45 ml               |
| Wash Buffer 1                                                                       | 1,5 ml x 2        | 60 ml               |
| Wash Buffer 2 (concentrate) **                                                      | 1.5 ml            | 35 ml               |
| RNase-free Water                                                                    | 0.5 ml            | 6 ml                |
| Filter Column FSRB                                                                  | 4 pcs             | 100 pcs             |
| Mini Column                                                                         | 4 pcs             | 100 pcs             |
| Collection Tube                                                                     | 8 pcs             | 200 pcs             |
| Elution Tube                                                                        | 4 pcs             | 100 pcs             |
| Micropestles                                                                        | 4 pcs             | 100 pcs             |
| DNase I 0,5U/ul                                                                     | -                 | 1 mg                |
| Preparation of Wash Buffer 2: add Ethanol volume for (wb2 concentrate) <sup>a</sup> | 6 ml              | 140 ml              |

### Specifications:

Principle: mini spin column (silica matrix)  
 Operation time: 30 ~ 60 minutes  
 Binding capacity: up to 100 µg total RNA/ column  
 Column applicability: centrifugation and vacuum  
 Minimum elution volume: 40 µl

| Sample                                               | Recommended amount of sample used                                       |                           | Yield (µg)                                   |
|------------------------------------------------------|-------------------------------------------------------------------------|---------------------------|----------------------------------------------|
| <b>Human whole blood</b><br>(up to 300 µl)           | 300 µl                                                                  |                           | 1                                            |
| <b>Animal cells</b><br>(up to 5 x 10 <sup>6</sup> )  | NIH/3T3<br>HeLa<br>COS-7<br>LMH                                         | 1 x 10 <sup>6</sup> cells | 10<br>15<br>30<br>12                         |
| <b>Animal Tissue</b><br>(Mouse/rat)<br>(up to 30 mg) | Embryo<br>Heart<br>Brain<br>Kidney<br>Liver<br>Spleen<br>Lung<br>Thymus | 10 mg                     | 25<br>10<br>10<br>30<br>50<br>35<br>15<br>45 |
| <b>Bacteria</b>                                      | E. coli<br>B. subtilis                                                  | 1 x 10 <sup>9</sup> cells | 60<br>40                                     |
| <b>Yeast</b><br>(up to 5 x 10 <sup>7</sup> )         | S. cerevisiae                                                           | 1 x 10 <sup>7</sup> cells | 25                                           |

### Brief procedure:



### Important Notes:

1. Make sure everything is RNase-free when handling RNA.
2. Buffers provided in this system contain irritants. Wear gloves and lab coat when handling these buffers.
3. **Caution: Beta-mercaptoethanol (Beta-Me) is hazardous to human health. perform the procedures involving Beta-Me in a chemical fume hood.**
4. Add required volume of RNase-free ethanol (96~100%) to Wash Buffer 2 when first use.
5. All centrifuge steps are done at full speed (~18,000 x g) in a microcentrifuge.
6. Prepare RNase-free DNase 1 reaction buffer (1M NaCl, 10 mM MnCl<sub>2</sub>, 20 mM Tris-HCl, pH 7.0 at 25°C) and make the final concentration of DNase I to 0.5 U/µl. (we recommend to use DNase I)
7. Dilute 1 mg of DNase I in 1 ml of DNase Buffer supplied with the kit, to obtain a final concentration of 0.5U / ul

## **Protocol: Isolation of Total RNA from Human Whole Blood**

### **Read Important Notes Before Starting Following Steps.**

Additional requirement:  $\beta$ -Mercaptoethanol and 70% RNase-free ethanol

#### **1. Red blood cells lysis**

1-1. Add 200 ~ 300  $\mu$ l of anticoagulant-preserved fresh human whole blood to a microcentrifuge tube (1.5 ml or 2.0 ml tube) (not provided). If the sample volume is more than 200  $\mu$ l, use a 2.0 ml tube as the sample container.

**-- Note! Do not overload, too much sample will make cell lysis incompletely and lead to lower RNA yield and purity.**

1-2. Mix 5 volume of FSRL Buffer with 1 volume of the sample and mix well by inversion.

1-3. Incubate on ice for 10 min. Vortex briefly 2 times during incubation.

1-4. Centrifuge for 1 min at 4,500 rpm to form a cell pellet and discard the supernatant completely.

1-5. Add 600  $\mu$ l of FSRL Buffer to resuspend the cell pellet by briefly vortexing.

1-6. Centrifuge for 1min at 4,500 rpm to form a cell pellet again and discard the supernatant completely.

2- Add 350  $\mu$ l of FSRB Buffer and 3.5  $\mu$ l of  $\beta$ -Mercaptoethanol to the cell pellet. Vortex vigorously for 1 min to resuspend the cells completely.

**-- Note: If the clump is still visible after vortex, pipet sample mixture up and down to break down the clump.**

3- Place a Filter Column to a Collection Tube and transfer the sample mixture to the Filter Column. Centrifuge at full speed (~ 18,000 x g) for 2 min.

4- Transfer the clarified supernatant from the Collection Tube to a new microcentrifuge tube (not provided), and measure the volume of the supernatant.

**-- Note: Avoid to pipet any debris and pellet when transferring the supernatant.**

5- Add 1 volume of 70 % RNase-free ethanol and mix well by vortexing.

6- Place a FSRB Mini Column to a Collection Tube and transfer the ethanol added sample mixture (including any precipitate) to the FSRB Mini Column. Centrifuge at full speed for 1 min, discard the flow-through and return the FSRB Mini Column back to the Collection Tube.

7- Optional step: DNase I digestion To eliminate genomic DNA contamination, follow the steps from 7a. Otherwise, proceed to step 8 directly.

Add 250  $\mu$ l of Wash Buffer 1 to the FSRB Mini Column, centrifuge at full speed for 1 min. Discard the flow-through and return the FSRB Mini Column back to the Collection Tube.

Add 60  $\mu$ l of RNase-free DNase 1 solution (0.5U/ $\mu$ l, not provided) to the membrane center of the FSRB Mini Column. Place the column on the benchtop for 15 min.

Add 250  $\mu$ l of Wash Buffer 1 to the FSRB Mini Column, centrifuge at full speed for 1 min. Discard the flow-through and return the FSRB Mini Column back to the Collection Tube.

After DNase 1 treatment, proceed to step 9.

8- Add 500  $\mu$ l of Wash Buffer 1 to the FSRB Mini Column, centrifuge at full speed for 1 min. Discard the flow-through and return the FSRB Mini Column back to the Collection Tube.

9- Add 750  $\mu$ l of Wash Buffer 2 to the FSRB Mini Column, centrifuge at full speed for 1 min. Discard the flow-through and return the FSRB Mini Column back to the Collection Tube. **-- Note: Make sure that ethanol has been added into Wash Buffer 2 when first use.**

10- Repeat step 9 for one more washing.

11- Centrifuge the FSRB Mini Column at full speed for an additional 3 min to dry the FSRB Mini Column. **-- Important Step! This step will avoid the residual liquid to inhibit subsequent enzymatic reaction.**

12- Place the FSRB Mini Column to a Elution Tube (provided, 1.5 ml microcentrifuge tube).

13- Add 40 ~ 100  $\mu$ l of RNase-free ddH<sub>2</sub>O to the membrane center of the FSRB Mini Column. Stand the FSRB Mini Column for 1 min.

**-- Important Step! For effective elution, make sure that RNase-free ddH<sub>2</sub>O is dispensed on the membrane center and is absorbed completely.**

**-- Important : Do not elute the RNA using RNase-free water less than suggested volume (< 40  $\mu$ l). It will lower the RNA yield.**

14- Centrifuge the FSRB Mini Column at full speed for 1 min to elute RNA.

15- Store RNA at -70°C.

## **Protocol: Isolation of Total RNA from Animal Cells**

### **Read Important Notes Before Starting Following Steps.**

Additional requirement:

- $\beta$ -Mercaptoethanol
  - 70% RNase-free ethanol
1. Collect  $1 - 5 \times 10^6$  cells by centrifuge at  $300 \times g$  for 5 min at  $4^\circ\text{C}$ . Remove all the supernatant.  
**-- Note! Do not overload, too much sample will make cell lysis incompletely and lead to lower RNA yield and purity.**
  2. Add 350  $\mu\text{l}$  of FSRB Buffer and 3.5  $\mu\text{l}$  of  $\beta$ -Mercaptoethanol to the cell pellet. Vortex vigorously for 1 min to resuspend the cells completely.  
**-- Note: If the clump is still visible after vortex, pipet sample mixture up and down to break down the clump.**
  3. Follow Human Whole Blood Protocol starting from step 3.

## **Protocol: Isolation of Total RNA from Animal Tissues (fresh & frozen)**

### **Read Important Notes Before Starting Following Steps.**

Additional equipment:

- liquid nitrogen & mortar
  - a rotor-stator homogenizer or a 20-G needle syringe
  - $\beta$ -Mercaptoethanol
  - 70% RNase-free ethanol
- 1a. **(For Fresh sample):** Cut up to 30 mg of tissue sample. Grind the tissue sample completely in liquid nitrogen. Transfer the powder to a new microcentrifuge tube(not provided). Or you can place tissue sample into a microcentrifuge tube and use provided micropestle to grind the tissue sample few times and break it into small pieces.
  - 1b. **(For Frozen sample)** Weight up to 30 mg tissue sample and grind the tissue sample in liquid nitrogen then transfer the powder to a new microcentrifuge tube (not provided).
  2. Add 350  $\mu\text{l}$  of FSRB Buffer and 3.5  $\mu\text{l}$  of  $\beta$ -Mercaptoethanol. Homogenize the sample by using a rotor-stator homogenizer or by passing the sample lysate through a 20-G needle syringe 10 times. Incubate at room temperature for 5 min.  
**-- Important step: In order to release more RNA from the harder samples, it is recommended to homogenize the sample by using suitable homogenize equipment, for example, with a rotot-stator homogenizer.**
  3. Follow Human Whole Blood Protocol starting from step 3.

## **Protocol: Isolation of Total RNA from Paraffin-embedded tissues**

### **Read Important Notes Before Starting Following Steps.**

Additional equipment:

- xylene & ethanol (96-100%)
  - liquid nitrogen & mortar
  - a rotor-stator homogenizer or a 20-G needle syringe
  - $\beta$ -Mercaptoethanol
  - 70% RNase-free ethanol
1. Transfer up to 15 mg paraffin-embedded tissue sample to a microcentrifuge tube (not provided)  
**--Remove the extra paraffin to minimize the size of the sample slice.**
  2. Add 0.5 ml xylene, mix well and incubate at room temperature for 10 min.
  3. Centrifuge at full speed for 3 min. Remove the supernatant by pipetting.
  4. Add 0.25 ml xylene, mix well and incubate at room temperature for 3 min.
  5. Centrifuge at full speed for 3 min. Remove the supernatant by pipetting.
  6. Repeat step 4 and step 5
  7. Add 0.3 ml ethanol (96- 100 %) to the deparaffined tissue, mix gently by vortexing. Incubate at room temperature for 3 min.
  8. Centrifuge at full speed for 3 min. Remove the supernatant by pipetting.
  9. Repeat step 7 and step 8.
  10. Follow Animal tissue Protocol starting from step 1 for sample disruption then follow Human Whole Blood protocol starting from step 3.

## **Protocol: RNA Clean-Up**

### **Read Important Notes Before Starting Following Steps.**

Additional equipment: xylene & ethanol (96-100%)

1. Transfer 100  $\mu$ l of RNA sample to a microcentrifuge tube (not provided).  
-- If the RNA sample is less than 100  $\mu$ l, add RNase-free water to make the sample volume to 100  $\mu$ l.
2. Add 300  $\mu$ l of FSRB Buffer and 300  $\mu$ l of RNase-free ethanol (96-100%) and mix well by vortexing.
3. Place a FSRB Mini Column to a Collection Tube and transfer the ethanol added sample mixture to the FSRB Mini Column. Centrifuge at full speed for 1 min and discard the flow-through and return the FSRB Mini Column back to the Collection Tube.
4. Follow Human Whole Blood Protocol starting from step 8.

## **Protocol: Isolation of Total RNA from Bacteria**

### **Read Important Notes Before Starting Following Steps.**

Additional requirement:

- $\beta$ -Mercaptoethanol
  - 70% RNase-free ethanol
  - 30 °C water bath or heating block
  - 2 ml screw centrifuge tube
  - Lysozyme reaction solution: (10mg/ml lysozyme; 20mM Tris-HCl, pH 8.0; 2mM EDTA; 1.2% Triton)
  - Acid-washed glass beads, 500 - 700  $\mu$ m
1. Transfer up to  $1 \times 10^9$  cells well-grown bacterial culture to a 2 ml screw centrifuge tube.  
-- **Note! Make sure the amount of total RNA harvested from sample do not exceed the column's binding capacity (100  $\mu$ g) when estimate the sample size. Too much sample will make cell lysis incompletely and lead to lower RNA yield and purity. If RNA amount is hard to determine on some species, using  $\leq 5 \times 10^8$  cells as the starting sample size.**
  2. Descend the bacterial cells by centrifuge at full speed ( $-18,000 \times g$ ) for 2 min at 4 °C. Remove all the supernatant.
  3. Add 100  $\mu$ l of lysozyme reaction solution. Pipet up and down to resuspend the cell pellet and incubate at 37 °C for 10 min.
  4. Add 350  $\mu$ l of FSRB Buffer and 3.5  $\mu$ l of  $\beta$ -Mercaptoethanol.
  5. Add 250 mg of acid-washed glass beads (500 - 700 nm) and vortex vigorously for 5 min to disrupt the cells.
  6. Centrifuge at full speed ( $-18,000 \times g$ ) for 2 min to spin down insoluble material. Transfer the supernatant to a microcentrifuge tube (not provided) and measure the volume of the clear lysate.  
-- **Note! Avoid pipetting any debris and pellet in the Collection Tube.**
  7. Follow Human Whole Blood Protocol starting from step 5.

## **Protocol: Isolation of Total RNA from Yeast**

### **Read Important Notes Before Starting Following Steps.**

Additional requirement:  $\beta$ -Mercaptoethanol

70% RNase-free ethanol

Enzymatic disruption: Lyticase or zymolase

Sorbitol buffer (1 M sorbitol; 100 mM EDTA; 0.1%  $\beta$ -ME)

30 °C water bath or heating block

Mechanical disruption: 2 ml screw centrifuge tube

Acid-washed glass beads, 500 - 700  $\mu$ m

1. Collect up to  $5 \times 10^7$  of yeast culture by centrifuge at  $5,000 \times g$  for 10 min at 4 °C. Remove all the supernatant.

**2A. Enzymatic disruption:**

**2A-1:** Resuspend the cell pellet in 600  $\mu$ l sorbitol buffer (1 M sorbitol; 100 mM EDTA; 0.1%  $\beta$ -ME) (not provided). Add 200 U zymolase or lyticase and incubate at 30 °C for 30 min.

--**Note! Prepare sorbitol buffer just before use.**

**2A-2:** Centrifuge at  $300 \times g$  for 5 min to pellet the spheroplasts. Remove all the supernatant.

**2A-3:** Add 350  $\mu$ l of FSRB Buffer and 3.5  $\mu$ l of  $\beta$ -Mercaptoethanol to the pellet. Vortex vigorously to disrupt the spheroplasts for 1 min. Incubate sample mixture at room temperature for 5 min

**2B. Mechanical disruption:**

**2B-1:** Add 350  $\mu$ l of FSRB Buffer and 3.5  $\mu$ l of  $\beta$ -Mercaptoethanol to the pellet and vortex vigorously to resuspend the cells completely.

**2B-2:** Transfer the sample mixture to a 2 ml screw centrifuge tube and add 250 mg of acid-washed glass beads (500 - 700  $\mu$ m) and vortex vigorously for 15 min to disrupt the cells.

- Follow Human Whole Blood Protocol starting from step 5