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**All-In-One Mini-Preps Kit**  
(Cell, Tissue, Plant)

**BS88003** (50 Preps)  
**BS88203** (50 Preps)  
QF 24 TV5  
CV1 2021

*For Research Use Only*

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## All-In-One DNA/RNA/Protein Mini-preps Kit

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### Introduction

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All-In-One DNA/RNA/Protein Mini-preps Kit is designed for simultaneous extraction of total RNA, genomic DNA and protein from a single biological sample. DNA, RNA and protein are isolated without splitting the sample prior to extraction. DNA, RNA and Protein can be isolated from cultured eukaryotic cells, animal and plant tissues.

This kit provides an innovative buffer system and a silica-based column nucleic acid purification technology to separate pure genomic DNA from total RNA. There is no need for phenol/chloroform extraction. Purified DNA is suitable for downstream applications such as Restriction Endonuclease Digestions, PCR and other applications. Isolated total RNA can be used for mRNA isolation, probe generation, RT-PCR, Northern blot analysis, primer extension, RNA protection assay and In vitro translation.

Protein is purified in denatured form with a special buffer (PP Solution) which effectively precipitates protein. After washing steps, the protein pellet is dissolved in PD Solution. Isolated protein is suitable for SDS-PAGE, Western Blot analysis and quantification. The procedure is simple and fast. Genomic DNA, total RNA and Proteins can be isolated in less than 1 hour.

### Features

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- Genomic DNA, RNA and Proteins can be simultaneously isolated in less than 1 hour.
- Preparation of high quality genomic DNA with a molecular weight  $\geq 20$  kb.
- Preparation of high quality total RNA without genomic DNA.
- Isolated protein is suitable for SDS-PAGE and Western Blot analysis.
- No phenol/chloroform extraction or ethanol precipitation is required.
- High yield and reproducible.

## Kit Contents

Component	BS88003, 50 Preps
Buffer Lysis-DRP	45 ml
CW1 Solution (concentrate)	13 ml
CW2 Solution (concentrate)	9 ml
CE Buffer	10 ml
GT Solution (concentrate)	18 ml
NT Solution (concentrate)	6 ml
RNase-Free Water	5 ml
PP Solution	35 ml
PD Solution	10 ml
EZ-10 DNA Column (blue) (with 2.0-ml Collection Tube)	50
RZ-10 RNA Column (uncolored) (with 2.0-ml Collection Tube)	50
Protocol	1

## Storage Conditions

The kit should be stored dry, at room temperature (15-25°C) and is stable for 1 year under these conditions.

## Applications

Direct correlation between genetic and proteomic data.

Efficient of up to 10 µg of genomic DNA purification from animal tissue. Purified genomic DNA has an average length of 20-30 kb. DNA of this length is particularly suitable for PCR, where complete denaturation of the template is important to achieve the highest amplification efficiency. The purified DNA is ready to use in any downstream application, including:

- PCR and real-time PCR
- Southern, dot and slot blot analyses
- Comparative genome hybridization (CGH)
- Genotyping, SNP analysis

Efficient of up to 20 µg of total RNA purification from animal tissue. The purified RNA is ready to use in any downstream applications, including:

- RT-PCR
- Quantitative, real-time RT-PCR
- Differential display
- cDNA synthesis
- Northern, dot and slot blot analyses
- Primer extension
- Poly A + RNA selection
- RNase/S1 nuclease protection

- RNase/S1 nuclease protection
- Microarrays

Isolation protein in denatured form. The purified protein is suitable for downstream applications such as:

- 1D gel electrophoresis
- Western blotting

## Quality Control

Each lot of All-In-One DNA/RNA/Protein Mini-preps Kit is tested against predetermined specifications to ensure consistent product quality.

## Materials Supplied by User

- Microcentrifuge capable of at least 12,000 × g
- RNase-Free pipettes and pipette tips
- Vortexer
- Isopropanol
- RNase-Free ethanol (96-100%)
- 50% ethanol
- RNase-Free microcentrifuge tubes (1.5 ml)

## Before Starting

Check the Buffer Lysis-DRP for salt precipitation before each use. If necessary, redissolve the precipitate by warming the solution at 56°C, then cool back down to room temperature before use.

CE Buffer is 10 mM Tris-HCl, 0.5 mM EDTA, pH 9.0. Water can be used as eluate in the DNA final step should EDTA be avoided for the following applications. However, this is not recommended if the pH of water is less than 7.0.

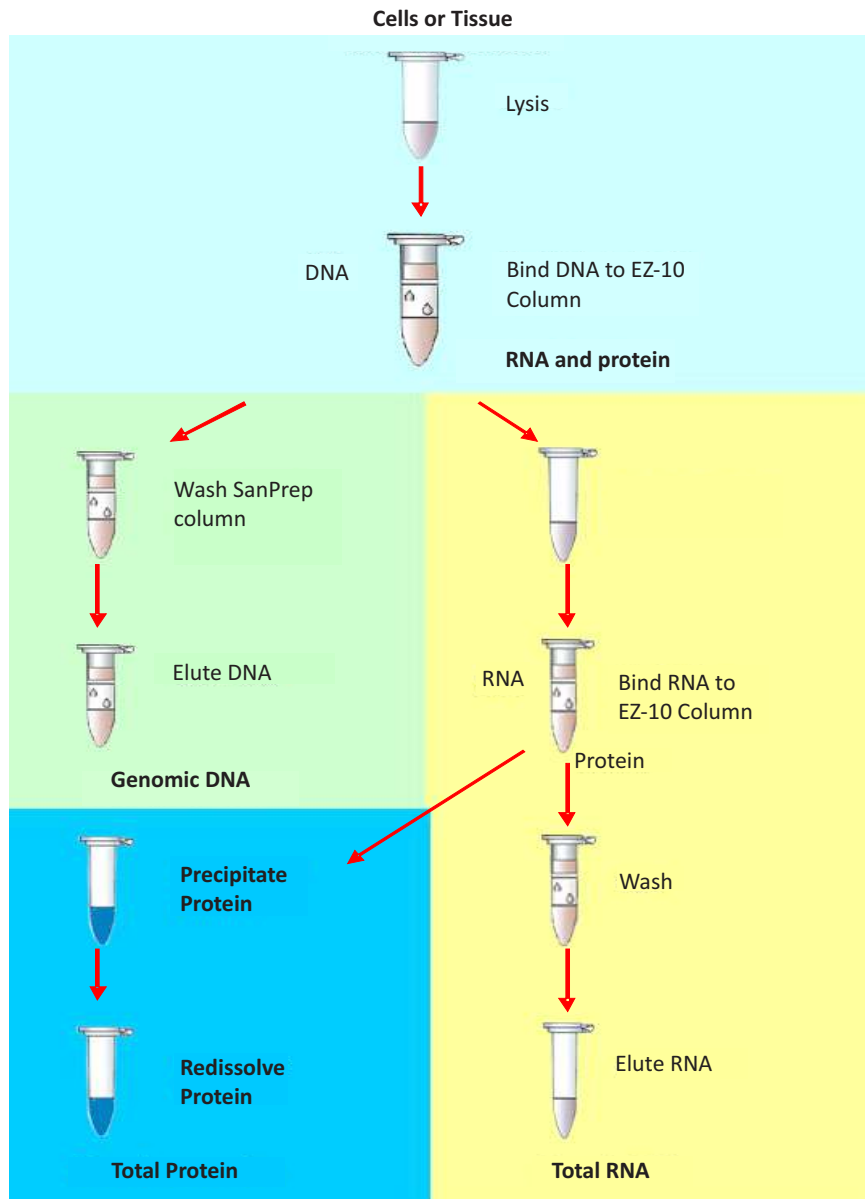
Cw1 Solution, CW2 Solution, GT Solution and NT Solution are supplied as concentrates. Before using for the first time, add **17 ml** ethanol to **13 ml** CW1 Solution, **21 ml** ethanol to **9 ml** CW2 Solution, **12 ml** ethanol to **18 ml** GT Solution and **24 ml** ethanol to **6 ml** NT Solution to make a work solution.

	Ethanol (96-100%)	Final Volume
CW1 Solution (13ml)	17 ml	30 ml
CW2 Solution (9ml)	21ml	30 ml
GT Solution (18ml)	12 ml	30 ml
NT Solution (6ml)	24 ml	30 ml



PRODUCTS ARE INTENDED FOR BASIC SCIENTIFIC RESEARCH ONLY.  
NOT INTENDED FOR HUMAN OR ANIMAL USE.

## DNA/RNA/Protein Isolation Procedure



## Protocol

1. Sample preparation (Blood)
    - A. Cell Cultures
      - 1a. Cells grown in suspension: Spin appropriate number of cells (max.  $1 \times 10^7$ ) at  $300 \times g$  for 5 minutes at room temperature. Remove supernatant carefully, proceed to step 2.
      - 1a. Cells grown in monolayer: Aspirate the medium and add  $350 \mu\text{l}$  Buffer Lysis-DRP to the cell-culture dish. Collect the lysate with a rubber policeman. Pipet the lysate into a microcentrifuge tube. Vortex or pipette to mix, and ensure that no cell clumps are visible before proceeding to step 2.
        - If sample can not be used immediately for genomic DNA extraction, it is recommended to store at  $-80^\circ\text{C}$  for long-term.
        - Avoid repeated freezing and thawing of stored samples, since this leads to degrade RNA.
    - B. Animal tissue: Grind  $15\sim 30$  mg animal tissue to fine powder in liquid nitrogen. Transfer the frozen powder to 1.5 ml RNase-free centrifuge tube, and allow the liquid nitrogen to evaporate.
      - For tissues with a very high number of cells, such as spleen, no more than 10 mg starting material should be used.
      - Do not let the tissue sample thaw before adding Buffer Lysis-DRP.
    - C. Plant: Grind  $25\sim 50$  mg plant tissue to fine powder in liquid nitrogen. Transfer the frozen powder to 1.5 ml RNase-free centrifuge tube, and allow the liquid nitrogen to evaporate.
      - Do not let the tissue sample thaw before adding Buffer Lysis-DRP.
  2. Add  $350 \mu\text{l}$  Buffer Lysis-DRP immediately to the 1.5 ml RNase-Free centrifuge tube above, mix by vortex. Incubate at room temperature for 5 minutes.
  3. Centrifuge at  $12,000 \times g$  for 3 minutes at  $4^\circ\text{C}$ . Transfer the supernatant to a new RNase-Free tube.
- ### Genomic DNA purification
4. Place the EZ-10 DNA Column in a 2 ml collection tube. Transfer the lysate to the column, keep at room temperature for 1 minute, centrifuge at  $9,000 \times g$  for 1 minute at room temperature. Transfer the flow-through to a new RNase-Free tube for RNA purification.
    - Store the flow-through at  $4^\circ\text{C}$  or isolation RNA (step 11-17) before DNA wash and elution.
  5. Add  $350 \mu\text{l}$  Buffer Lysis-DRP to the EZ-10 DNA Column, keep at room temperature for 1 minute, centrifuge at  $9,000 \times g$  for 1 minute at room temperature, discard the liquid in the collection tube.
  6. Place the EZ-10 DNA Column in the collection tube, and add  $500 \mu\text{l}$  CW1 Solution to the EZ-10 DNA Column, keep at room temperature for 1 minute, centrifuge at  $9,000 \times g$  for 1 minute at room temperature, discard the liquid in the collection tube.
    - Check the label to ensure CW1 Solution was diluted with ethanol.

7. Place the EZ-10 DNA Column in the collection tube, and add 500 µl CW2 Solution to the EZ-10 DNA Column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature, discard the liquid in the collection tube.
  - Check the label to ensure CW2 Solution was diluted with ethanol.
8. Place the EZ-10 DNA Column in the collection tube, and centrifuge at 9,000 x g for 2 minutes at room temperature
9. Incubate the open spin column at room temperature for 2-3 minutes until the ethanol has completely evaporated. Transfer the column to a clean 1.5 ml centrifuge tube.
  - It is important to dry the membrane of the EZ-10 DNA Column, since residual ethanol may interfere with subsequent reactions. This step ensures that no residual ethanol will be carried over during the following elution.
10. Add 50 µl CE Buffer directly onto the center part of EZ-10 DNA Column membrane. Incubate at room temperature for 2 minutes, and then centrifuge for 2 minutes at 9,000 x g to elute the DNA.
  - Warm the Buffer CE to 60°C will increase the elution efficiency.
  - Elution with more than 50 µl (e.g. 100 µl) increases the DNA yield, but the concentration will be lower.
  - For maximum DNA yield, repeat elution once as described in this step.
  - A new microcentrifuge tube can be used for the second elution step to prevent dilution of the first eluate.

### Total RNA purification

**NOTE:** Care must be taken when working with RNA. It is important to maintain an RNase-free environment starting with RNA sample preparation and continue through purification and analysis. Use RNase free tubes, tips, gels. Wear gloves at all times.

11. Add 250 µl ethanol to the flow-through from step 4, mix thoroughly.
12. Place the RZ-10 RNA Column in the collection tube and transfer the mixture to the RZ-10 RNA Column, centrifuge at 9,000 x g for 1 minute at room temperature.
13. Transfer the flow-through to a new 1.5 ml centrifuge tube for total protein purification.
14. Place the RZ-10 RNA Column in the collection tube, add 500 µl GT Solution, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature. Discard the flow-through.
  - Check the label to ensure GT Solution was diluted with ethanol.
15. Add 500 µl NT Solution to the column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature. Discard the flow-through.
  - Check the label to ensure NT Solution was diluted with ethanol.
16. Place the column in the collection tube, and centrifuge at 9,000 x g for 2 minutes at room temperature.
  - It is important to dry the membrane of the RZ-10 RNA Column, since residual ethanol may interfere with subsequent reactions. This centrifugation step ensures that no residual ethanol will be carried over during the following elution.

17. Transfer the column into a new RNase-Free centrifuge tube, add 30-50 µl RNase-Free water, keep at room temperature for 2 minutes, and centrifuge at 9,000 x g for 2 minutes.
  - The solution in the centrifuge tube is the RNA sample, it can be used immediately for downstream molecular operation or stored at -70°C.

### Total Protein precipitation

18. Add 600 µl PP Solution to the centrifuge tube from step 13, mix thoroughly, and keep at room temperature for 10 minutes to precipitate protein.
19. Centrifuge at 9,000 x g for 10 minutes at room temperature, and carefully discard the supernatant.
20. Add 500 µl 50% ethanol to the protein pellet, centrifuge at 9,000 x g for 1 minute, and remove the supernatant as much liquid as possible.
  - When washing the protein pellet with 50% ethanol, disturb the pellet by pipetting up and down several times.
21. Dry the protein pellet for 5-10 minutes at room temperature.
22. Add up to 100 µl PD Solution and mix thoroughly to dissolve the protein pellet.
23. Incubate for 5 minutes at 95°C to completely dissolve and denature the protein. Then cool the sample to room temperature.
24. Centrifuge at 9,000 x g for 2 minutes to pellet any residual insoluble material.
25. Transfer the supernatant to a new 1.5 ml centrifuge tube.
  - The solution in the centrifuge tube is the protein solution, it can be used immediately for downstream applications such as SDS-PAGE and western blotting or stored at -20°C.

### General Guidelines

All-In-One DNA/RNA/Protein Mini-preps Kit provides a new technology for selective binding of double-stranded DNA with EZ-10 DNA Column, and binding of total RNA with RZ-10 RNA Column, and purifying protein with a new protein precipitation chemistry.

Biological samples are first lysed and homogenized in a highly denaturing guanidine-containing buffer (buffer lysis-DRP), which immediately inactivates DNases and RNases as well as proteases to ensure isolation of intact DNA, RNA and proteins.

DNA in the whole homogenate is selectively absorbed on EZ-10 DNA Column. Wash the membrane with the buffer lysis-DRP to remove RNA/Protein contaminants on the EZ-10 DNA spin column. PCR inhibitors, protein and salts are completely removed with CW1 Solution and CW2 Solution. Purified genomic DNA is eluted in CE buffer.

Ethanol is added to the flow-through from the EZ-10 DNA spin column to provide appropriate binding conditions for RNA, and the sample is then applied to a RZ-10 spin column, where total RNA binds to the membrane. RCR inhibitors, protein and salts are completely removed with GT Solution and NT Solution. Purified RNA is eluted in RNase-Free water.

Buffer PP Solution, a novel aqueous protein precipitation solution, is added to the flow-through of the RZ-10 spin column, and the precipitated proteins are pelleted by centrifugation. Intact total proteins are redissolved in PD Solution and then ready to use in downstream applications.

## All-In-One DNA/RNA Mini-Preps Kit

### Introduction

All-In-One DNA/RNA Mini-preps Kit is designed for simultaneous extraction of total RNA and genomic DNA from a single biological sample. DNA and RNA are isolated without splitting the sample prior to extraction. DNA and RNA can be isolated from cultured eukaryotic cells, animal and plant tissues.

This kit, using an innovative buffer system, requires no need for phenol/chloroform extractions and provides column to separately pure genomic DNA and total RNA. Purified DNA is suitable for downstream applications such as Restriction Endonuclease Digestions, PCR, and so on. The isolated RNA can be used for mRNA isolation, probe generation, RT-PCR, Northern blot analysis, primer extension, RNA protection assay and In vitro translation. The procedure is simple and fast. Genomic DNA and RNA can be isolated in less than 40 minutes.

### Features

- Genomic DNA and total RNA can be simultaneously isolated in less than 40 minutes.
- Preparation of high quality genomic DNA with a molecular weight  $\geq 20$  kb.
- Preparation of high quality total RNA without genomic DNA.
- High yield and reproducible.
- No phenol/chloroform extraction or ethanol precipitation is required.

### Kit Contents

Component	BS88203, 50 Preps
Buffer Lysis-DR	20 ml
CW1 Solution (concentrate)	13 ml
CW2 Solution (concentrate)	9 ml
CE Buffer	10 ml
GT Solution (concentrate)	18 ml
NT Solution (concentrate)	6 ml
RNase-Free Water	5 ml
EZ-10 DNA Column (blue) (with 2.0-ml Collection Tube)	50
RZ-10 RNA Column (uncolored) (with 2.0-ml Collection Tube)	50
Protocol	1

### Storage Conditions

The kit should be stored dry, at room temperature (15-25°C) and is stable for 1 year under these conditions.

### Applications

Efficient of up to 10  $\mu$ g of genomic DNA purification from animal tissue. Purified genomic DNA has an average length of 20-30 kb. DNA of this length is particularly suitable for PCR, where complete denaturation of the template is important to achieve the highest amplification efficiency. The purified DNA is ready to use in any downstream applications, including:

- PCR and real-time PCR
- Southern, dot and slot blot analyses
- Comparative genome hybridization (CGH)
- Genotyping, SNP analysis

Efficient of up to 20  $\mu$ g of total RNA purification from animal tissue. The purified RNA is ready to use in any downstream application, including:

- RT-PCR
- Quantitative, real-time RT-PCR
- Differential display
- cDNA synthesis
- Northern, dot and slot blot analyses
- Primer extension
- Poly A + RNA selection
- RNase/S1 nuclease protection
- Microarrays

### Quality Control

Each lot of All-In-One DNA/RNA Mini-preps Kit is tested against predetermined specifications to ensure consistent product quality.

### Materials Supplied by User

- Microcentrifuge capable of at least 12,000  $\times$  g
- RNase-Free pipettes and pipette tips
- Vortexer
- Isopropanol
- RNase-Free ethanol (96-100%)
- RNase-Free microcentrifuge tubes (1.5 ml)

## Before Starting

Check the Buffer Lysis-DR for salt precipitation before each use. If necessary, redissolve the precipitate by warming the solution at 56°C, then cool back down to room temperature before use.

CE Buffer is 10 mM Tris-HCl, 0.5 mM EDTA, pH 9.0. Water can be used as eluate in the DNA final step if EDTA should be avoided for the following applications, but it is not recommended if the pH of water is less than 7.0.

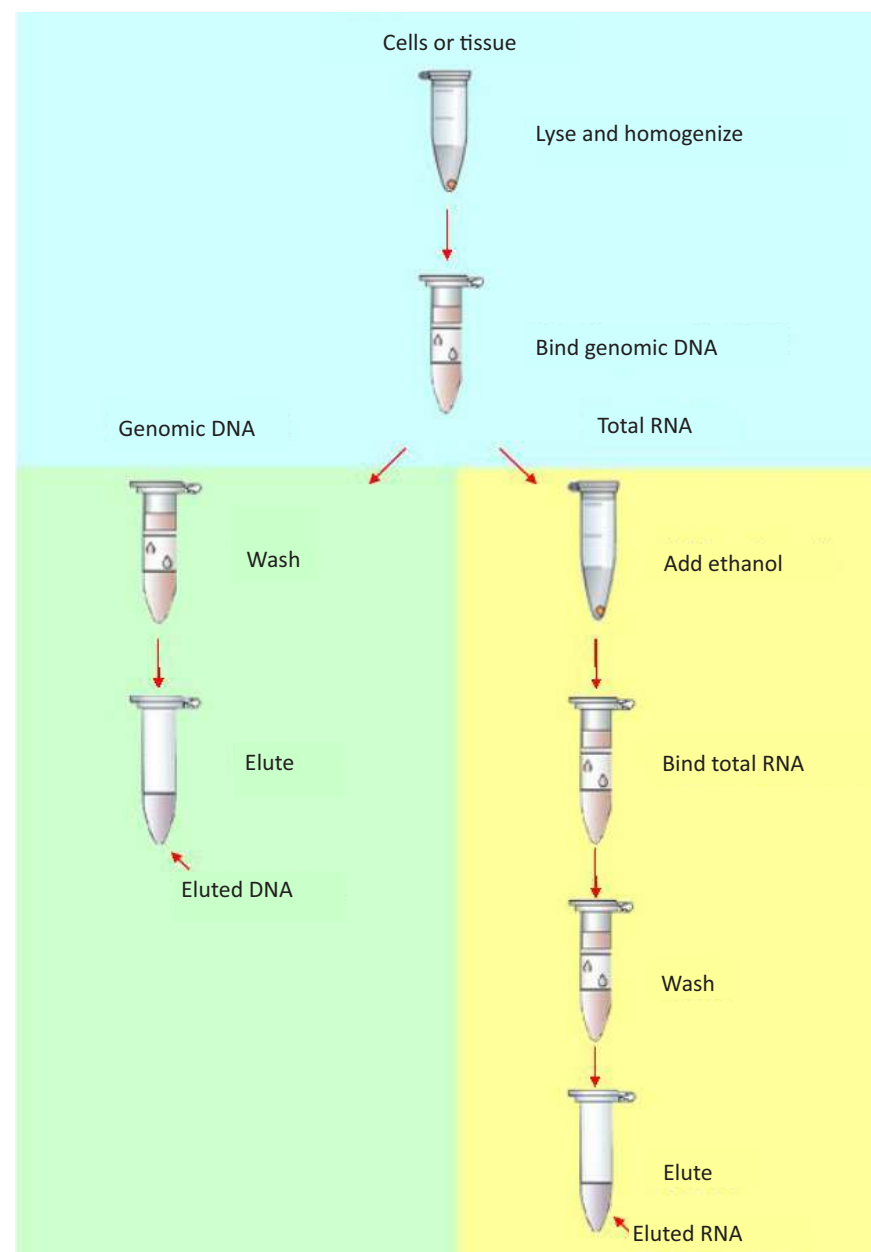
CW1 Solution, CW2 Solution, GT Solution and NT Solution are supplied as concentrates. Before using for the first time, add **17 ml** ethanol to **13 ml** CW1 Solution, **21 ml** ethanol to **9 ml** CW2 Solution, **12 ml** ethanol to **18 ml** GT Solution and **24 ml** ethanol to **6 ml** NT Solution to make a work solution.

	Ethanol (96-100%)	Final Volume
CW1 Solution (13ml)	17 ml	30 ml
CW2 Solution (9ml)	21ml	30 ml
GT Solution (18ml)	12 ml	30 ml
NT Solution (6ml)	24 ml	30 ml



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## DNA/RNA Isolation Procedure



## Protocol

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### 1. Sample preparation (Blood)

#### A. Cell Cultures

**1a.** Cells grown in suspension: Spin appropriate number of cells (max.  $1 \times 10^7$ ) at 300 x g for 5 minutes at room temperature. Remove supernatant carefully, proceed to step 2.

**1b.** Cells grown in monolayer: Aspirate the medium and add 350  $\mu$ l Buffer Lysis-DR to the cell-culture dish. Collect the lysate with a rubber policeman. Pipette the lysate into a microcentrifuge tube. Vortex or pipette to mix, and ensure that no cell clumps are visible before proceeding to step 3.

- If sample can not be used immediately for genomic DNA extraction, it is recommended to store at  $-80^{\circ}\text{C}$  for long-term.
- Avoid repeated freezing and thawing of stored samples, since this leads to RNA degradation.

**B.** Animal tissue: Grind 15~30 mg animal tissue to fine powder in liquid nitrogen. Transfer the frozen powder to 1.5 ml RNase-free centrifuge tube, and allow the liquid nitrogen to evaporate.

- For tissues with a very high number of cells, such as spleen, no more than 10 mg starting material should be used.
- Do not let the tissue sample thaw before adding Buffer Lysis-DR.

**C.** Plant: Grind 25~50 mg plant tissue to fine powder in liquid nitrogen. Transfer the frozen powder to 1.5 ml RNase-free centrifuge tube, and allow the liquid nitrogen to evaporate.

- Do not let the tissue sample thaw before adding Buffer Lysis-DR.

**2.** Add 350  $\mu$ l Buffer Lysis-DR immediately to the 1.5 ml RNase-Free centrifuge tube above, mix by vortex.

**3.** Centrifuge at 12,000 x g for 3 minutes at  $4^{\circ}\text{C}$ . Transfer the supernatant to a new RNase-Free tube.

### Genomic DNA purification

**4.** Place the EZ-10 DNA Column in a 2 ml collection tube. Transfer the lysate to the column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature. Transfer the flow-through to a new RNase-Free tube for RNA purification.

- Store the flow-through at  $4^{\circ}\text{C}$  or isolation RNA (step 11-16) before DNA wash and elution.

**5.** Add 350  $\mu$ l Buffer Lysis-DR to the EZ-10 DNA Column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature, discard the liquid in the collection tube.

**6.** Place the EZ-10 DNA Column in the collection tube, and add 500  $\mu$ l CW1 Solution to the EZ-10 DNA Column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature, discard the liquid in the collection tube

- Check the label to ensure CW1 Solution was diluted with ethanol.

**7.** Place the EZ-10 DNA Column in the collection tube, and add 500  $\mu$ l CW2 Solution to the EZ-10 DNA Column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature, discard the liquid in the collection tube.

- Check the label to ensure CW2 Solution was diluted with ethanol.

**8.** Place the EZ-10 DNA Column in the collection tube, and centrifuge at 9,000 x g for 2 minutes at room temperature.

**9.** Incubate the open spin column at room temperature for 2-3 minutes until the ethanol has completely evaporated. Transfer the column to a clean 1.5 ml centrifuge tube.

- It is important to dry the membrane of the EZ-10 DNA Column, since residual ethanol may interfere with subsequent reactions. This step ensures that no residual ethanol will be carried over during the following elution.

**10.** Add 50  $\mu$ l CE Buffer directly onto the center part of EZ-10 DNA Column membrane. Incubate at room temperature for 2 minutes, and then centrifuge for 2 minutes at 9,000 x g to elute the DNA.

- Warm the Buffer CE to  $60^{\circ}\text{C}$  will increase the elution efficiency.
- Elution with more than 50  $\mu$ l (e.g. 100  $\mu$ l) increases the DNA yield, but the concentration will be lower.
- For maximum DNA yield, repeat elution once as described in this step.
- A new microcentrifuge tube can be used for the second elution step to prevent dilution of the first eluate.

### Total RNA purification

**NOTE:** Care must be taken when working with RNA. It is important to maintain an RNase-free environment starting with RNA sample preparation and continue through purification and analysis. Use RNase free tubes, tips, gels. Wear gloves at all times.

**11.** Add 250  $\mu$ l ethanol to the flow-through from step 4, mix thoroughly.

**12.** Place the RZ-10 RNA Column in the collection tube and transfer the mixture to the RZ-10 RNA Column, centrifuge at 9,000 x g for 1 minute at room temperature. Discard the flow-through.

**13.** Add 500  $\mu$ l GT Solution to the column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature. Discard the flow-through.

- Check the label to ensure GT Solution was diluted with ethanol.

**14.** Add 500  $\mu$ l NT Solution to the column, keep at room temperature for 1 minute, centrifuge at 9,000 x g for 1 minute at room temperature. Discard the flow-through.

- Check the label to ensure NT Solution was diluted with ethanol.

**15.** Place the column in the collection tube, and centrifuge at 9,000 x g for 2 minutes at room temperature.

- It is important to dry the membrane of the RZ-10 RNA Column, since residual ethanol may interfere with subsequent reactions. This centrifugation step ensures that no residual ethanol will be carried over during the following elution.

### Agarose gel electrophoresis

Agarose gel electrophoresis is a method used to estimate the size of DNA fragments or the concentration of DNA. Regular agarose gels may range in concentration from 0.7 to 1.0%.

DNA possesses a consistent charge to mass ratio, therefore the major factor influencing migration through a gel matrix is size (and occasionally secondary structure). Fragment sizes can be determined by comparison to standard DNA size markers.

## Quantity and quality of total RNA

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Quantity and quality of total RNA can be simply determined using two methods: absorbance (determine the concentration and purity of total RNA), formaldehyde agarose gel electrophoresis (determine the integrity of total RNA).

RNA is similar with DNA has a absorption peak at 260 nm.

You can calculate the concentration of the RNA in your sample as follows:

- 1 OD (optical density) at  $A_{260} = 40 \mu\text{g/ml}$  ssRNA
- RNA concentration ( $\mu\text{g/ml}$ ) =  $(OD_{260}) \times (\text{dilution factor}) \times (40 \mu\text{g RNA/ml}) / (1 \text{ OD}_{260} \text{ unit})$
- $OD_{260}/OD_{280}$  of purified RNA is generally 1.9-2.1.
- If there is contamination with genomic DNA or protein, the  $OD_{260}/OD_{280}$  will be less than 1.8. If chaotropic salts are present in the purified RNA, the  $OD_{260}/OD_{280}$  will be greater than 2.1.
- Generally, the  $OD_{260}/OD_{230}$  of RNA is greater than 2.0. If the ration of  $OD_{260}/OD_{230}$  is less than 2.0, the RNA solution may be contain chaotropic salts.

### Formaldehyde agarose gel electrophoresis

The intergrity and size distribution of total RNA purified can be checked by denaturing-agarose gel electrophoresis and ethidium bromide staining. According to the size of ribosomal RNAs, you can determine the integrity of total RNA.

Intact total RNA run on a denaturing gel will have sharp 28S and 18S rRNA bands (eukaryotic samples). The 28S rRNA band should be approximately twice as intense as the 18S rRNA band.

### FA gel preparation

To prepare FA gel (1.2% agarose) of size 10 x 14 x 0.7 cm, mix:

- 1.2 g agarose.
- 10 ml 10x FA gel buffer (see composition below)
- Add RNase-free water to 100 ml

If smaller or larger gels are needed, adjust quantities of components proportionately. Heat the mixture to melt agarose. Cool to 65°C in a water bath. Add 1.8 ml of 37% (12.3 M) formaldehyde and 1  $\mu\text{l}$  of a 10 mg/ml ethidium bromide stock solution. Mix thoroughly and pour onto gel support. Prior to running the gel, equilibrate in 1x FA gel running buffer (see composition below) for at least 30 minutes.

### RNA sample preparation for FA gel electrophoresis

Add 1 volume of 5x RNA loading buffer (see composition below) to 4 volumes of RNA sample (for example, 10  $\mu\text{l}$  of loading buffer and 40  $\mu\text{l}$  of RNA) and mix. Incubate for 3–5 minutes at 65°C, chill on ice, and load onto the equilibrated FA gel.

### Gel running conditions

Run gel at 5–7 V/cm in 1x FA gel running buffer.

## Composition of FA gel buffers

10x FA gel buffer

- 200 mM 3-[N-morpholino]propanesulfonic acid (MOPS) (free acid)
- 50 mM sodium acetate
- 10 mM EDTA
- pH to 7.0 with NaOH

1x FA gel running buffer

- 100 ml 10x FA gel buffer
- 20 ml 37% (12.3 M) formaldehyde
- 880 ml RNase-free water

5x RNA loading buffer

- 16  $\mu\text{l}$  saturated aqueous bromophenol blue solution
- 80  $\mu\text{l}$  500 mM EDTA, pH 8.0
- 720  $\mu\text{l}$  37% (12.3 M) formaldehyde
- 2 ml 100% glycerol
- 3.084 ml formamide
- 4 ml 10x FA gel buffer
- RNase-free water to 10 ml

Stability: approximately 3 months at 4°C

### Quantification of protein in SDS-PAGE

Isolation protein in denatured form is analysed in SDS-PAGE (Sodium dodecylsulfate polyacrylamide gel-electrophoresis) to detect mass and purity.

16. Transfer the column into a new RNase-Free centrifuge tube, add 30-50  $\mu\text{l}$  RNase-Free water, keep at room temperature for 2 minutes, and centrifuge at 9,000 x g for 2 minutes.
  - The solution in the centrifuge tube is the RNA sample, it can be used immediately for downstream molecular operation or stored at -70°C.

## General Guidelines

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All-In-One DNA/RNA Mini-preps Kit provides a new technology for selective binding of double-stranded DNA with EZ-10 DNA Column, and binding of total RNA with RZ-10 RNA Column.

Biological samples are first lysed and homogenized in a highly denaturing guanidine-containing buffer (buffer lysis-DR), which immediately inactivates DNases and RNases as well as proteases to ensure isolation of intact DNA and RNA.

DNA in the whole homogenate is selectively absorbed on EZ-10 DNA Column. Wash the membrane with the buffer lysis-DR to remove RNA/Protein contaminates on the EZ-10 DNA spin column. PCR inhibitors, protein and salts are completely removed with CW1 Solution and CW2 Solution. Purified genomic DNA is eluted in CE buffer.

Ethanol is added to the flow-through from the EZ-10 DNA spin column to provide appropriate binding conditions for RNA, and the sample is then applied to a RZ-10 spin column, where total RNA binds to the membrane. RCR inhibitors, protein and salts are completely removed with GT Solution and NT Solution. Purified RNA is eluted in RNase-Free water.

## Notes for Sample Preparation

### Sample collection and storage

Best results are obtained with fresh samples. When purifying total DNA/RNA from fresh samples, keep fresh cell and tissue samples in liquid nitrogen or on ice immediately after harvesting. Quickly proceed to sample lysis and homogenization.

If the samples need to be stored before using they should be frozen in liquid nitrogen or in RNALater (code: RT4171), and at -80°C for long term storage immediately. Avoid repeated freezing and thawing of stored samples, since this leads to DNA/RNA degradation.

### Sample Homogenize

We recommend treating the tissue samples with liquid nitrogen and proceeding to sample lysis immediately. However, homogenizer may also be used successfully.

Work quickly during sample harvesting and homogenizing, and always wear disposable gloves while handling samples and reagents to prevent RNase contamination.

Use pre-cool mortar, pestle and spatula to treat and transfer the samples. Do not let the tissue sample thaw before you add the lysis buffer.

### Starting amounts of samples

The yield and quality of DNA/RNA depend on the amount of starting material. It is important not to exceed the capacity of lysis buffer and membrane. Use advisable amount of starting material as follow:

Sample	Amount
Muscle tissue	30 mg
Liver or brain tissue	20 mg
Kidney or spleen tissue	10 mg
Cultured cells	5 x 10 <sup>6</sup>
Plant tissue	50 mg

## Quantity and quality of genomic DNA

Quantity and quality of genomic DNA can be simply determined using two methods: absorbance (determine the concentration and purity of genomic DNA), agarose gel electrophoresis (determine the concentration and length of genomic DNA).

## UV Spectrophotometric Analysis of DNA

DNA strongly absorb ultraviolet light at 260 nm. UV spectroscopy can be used as a quantitative technique to measure DNA concentration and purity. For greatest accuracy, readings should be between 0.1 and 1.0. You should ensure the concentrations of DNA solution are higher than 2.5 ng/μl. You can calculate the concentration of the DNA in your sample as follows:

- 1 OD (optical density) at A<sub>260</sub> = 50 μg/ml dsDNA
- DNA concentration (μg/ml) = (OD<sub>260</sub>) x (dilution factor) x (50 μg DNA/ml)/(1 OD<sub>260</sub> unit)
- DNA yield (μg) = DNA concentration x total DNA volume (ml)

The reading at 280 nm determines the amount of protein in a sample. A ratio of the OD<sub>260</sub>/OD<sub>280</sub> is an indicator of DNA purity. You can estimate the purity of the DNA in your sample as follows:

- OD<sub>260</sub>/OD<sub>280</sub> of purified DNA is generally 1.7-1.9. The ratio can be calculated after correcting for turbidity (absorbance at 320 nm).
- DNA Purity (OD<sub>260</sub>/OD<sub>280</sub>) = (OD<sub>260</sub> reading - OD<sub>320</sub> reading) ÷ (OD<sub>280</sub> reading - OD<sub>320</sub> reading).

If there is contamination with proteins or phenol, the OD<sub>260</sub>/OD<sub>280</sub> will be less than 1.6, and accurate quantitation of the amount of nucleic acid will not be possible.

It is also helpful when looking at the purity of DNA to take an absorbance reading at 230 nm. Strong absorbance around 230 nm can indicate that organic compounds or chaotropic salts are present in the purified DNA. A ratio between the readings at 260 nm and 230 nm (OD<sub>260</sub>/OD<sub>230</sub>) can help to evaluate the level of salt carryover in the purified nucleic acid. Generally, the OD<sub>260</sub>/OD<sub>230</sub> of DNA is greater than 1.8.

## Quantification of protein in SDS-PAGE

Isolation protein in denatured form is analysed in SDS-PAGE (Sodium dodecylsulfate polyacrylamide gel-electrophoresis) to detect mass and purity

### SDS-PAGE preparation

	5 ml	10 ml
<b>5% Stacking Gels:</b>		
40% Acryl/Bis 29:1	0.65 ml	1.3 ml
Milli Q H <sub>2</sub> O	3.07 ml	6.14 ml
0.5 M Tris-HCl/0.4%SDS, pH 6.8	1.25 ml	2.5 ml
TEMED (code: TB0508)	5 μl	10 μl
10% APS	25 μl	50 μl
<b>12% Separating Gels:</b>	<b>7.5 ml</b>	<b>15 ml</b>
40% Acryl/Bis 29:1 (code: A0007)	1.875 ml	3.75 ml
Milli Q H <sub>2</sub> O	3.125 ml	6.25 ml
1.5 M Tris-HCl/0.4%SDS, pH 8.8	2.5 ml	5 ml
TEMED (code: TB0508)	5 μl	10 μl
10% APS	25 μl	50 μl

### Protein sample preparation for SDS-PAGE

Purified protein solution with this kit be used directly for SDS-PAGE and western blotting.

### SDS-PAGE running conditions

- 50 V for about 40 minutes
- 150 V for about 30 minutes

### Troubleshooting

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#### DNA is contaminated with RNA

- The final homogenate should have a pH of 7.0. Make sure that the sample is not highly acidic or basic.
- Wash the EZ-10 DNA spin column once with the Buffer Lysis-DRP or Buffer Lysis-DR to remove DNA contaminants.
- Add RNase to the DNA elution directly.

#### Low Yield of DNA

- Homogenize tissue completely. Treat the tissue samples with liquid nitrogen or homogenizer.
- Wash the EZ-10 DNA spin column once with the Buffer Lysis-DRP or Buffer Lysis-DR to remove DNA contaminants.
- Check the label to ensure CW1 Solution and CW2 Solution were diluted with ethanol respectively.
- Elution step has to be strictly followed.
- Avoid overdrying the membrane of EZ-10 spin column. Incubate the membrane at room temperature 3-5 minutes to dry the membrane of the EZ-10 spin column. Do not leave the membrane at room temperature or 65°C for long-term.

#### RNA is contaminated with DNA

- Reduce the amount of starting material.
- For certain tissues with extremely high DNA content (e.g., thymus), some DNA will pass through the EZ-10 DNA spin column. Try using smaller sample size.
- Incomplete removal of cell-culture medium or stabilization reagent.

#### Low Yield of RNA

- We recommend using fresh samples.
- Homogenize tissue completely. Treat the tissue samples with liquid nitrogen or homogenizer.
- Use advisable amount of starting material. RNA yield is dependent on the type, size, age and storage of starting material.
- Check the label to ensure GT Solution and NT Solution were diluted with ethanol respectively.
- Elution step has to be strictly followed.

#### RNA degradation

- Use fresh sample. For frozen samples, ensure that they were flash-frozen immediately in liquid nitrogen and properly stored at -70°C.
- We recommend treating the tissue samples with liquid nitrogen and proceeding to sample lysis in Buffer Lysis-DRP or Buffer Lysis-DR immediately.
- Create a RNase-Free working environment.
- Wear gloves during all steps of the procedure. Change gloves frequently.
- Using of RNase-Free microcentrifuge tubes is recommended.

#### Clumping in binding steps

- Make sure samples are homogenized completely before binding the spin column.
- Centrifuge at 12,000 xg for 3 minutes to remove the fibres and cell debris before binding the spin column.
- Reduce the amount of starting material. Use advisable amount of starting material as direction on page 20.
- Check Buffer Lysis-DRP or Buffer Lysis-DR, if form precipitates upon storage, warm to 56°C to dissolve it before use.

#### Inhibition of downstream reactions

- Residual ethanol from the CW2 Solution can inhibit downstream enzymatic reactions. Centrifuge the column at 12,000 xg for 2 minutes and incubate the membrane at room temperature 3-5 minutes to dry the membrane of the EZ-10 spin column to remove the residual ethanol thoroughly.
- Residual salt can inhibit downstream enzymatic reactions. Ensure that wash steps have been operated at room temperature (15–25°C).

#### Difficult to dissolve protein pellets

- Resuspend/disturb the pellet by pipetting up and down several times. Then briefly centrifuge the sample, and use the supernatant for downstream analysis.
- Several types of protein are very difficult to solubilize, especially membrane proteins. To improve solubility, use a different resuspension buffer containing other detergent(s) more suitable for your protein of interest.
- For greater solubilization of proteins, dissolve the protein pellet in 5% (w/v) SDS or 8 M urea, or increase the volume of PD Solution.

#### Protein shows no clear pattern in SDS-PAGE

- When washing the protein pellet with 50% ethanol, disturb the pellet by pipetting up and down several times.
- The quality of SDS-PAGE can be influenced by several parameters independent of protein quality. Vary the protein load and/or the polyacrylamide concentration of the gel (which should be according to molecular mass of the protein of interest). Incubation of the sample for 10 minutes at 46°C before loading (instead of 95°C) can improve the resolution.

## Appendix

### The parameter of Column

	EZ-10 DNA Column	RZ-10 RNA Column
Colour	Blue	Colorless
Function	Binding DNA	Binding RNA
Maximum Binding Capacity	200 µg	200 µg
Maximum Loading Volume	750 µl	750 µl
Yes/No RNase-Free	Yes	Yes
Accepted Maximum Spin Speed	15,000 x g	15,000 x g

### Centrifugation Speed

Protocols for centrifugation typically specify the amount of acceleration to be applied to the sample, rather than specifying a rotational speed such as revolutions per minute. This distinction is important because two rotors with different diameters running at the same rotational speed will subject samples to different accelerations. This relationship between rpm and RCF (x g) may be written as:

$$\text{rpm} = 1000 \times (\text{RCF}/1.12r)^2$$

**r** is the semidiameter of rotor

**RCF** means relative centrifugal force

### Precipitation of RNA with ethanol.

1. Add 0.1 volume of 3 M sodium acetate, pH 5.2 and 2.5 volumes of 96–100 % ethanol to one volume of sample. Mix thoroughly.
2. Incubate several minutes to several hours at -20°C or 4°C.  
**NOTE:** Choose long incubation times if the sample contains low RNA concentration. Short incubation times are sufficient if the sample contains high RNA concentration.
3. Centrifuge for 10 minutes at maximum speed.
4. Wash RNA pellet with 70 % ethanol.
5. Dry RNA pellet and resuspend RNA in RNase-free H<sub>2</sub>O.

## Ordering Information

### All-In-One Mini-Preps Kit

Code	Product Name	Size
BS88003	All-In-One DNA/RNA/Protein Mini-preps Kit	50 Preps
BS88203	All-In-One DNA/RNA Mini-preps Kit	50 Preps

### Related Products

Code	Product Name	Size
BS410A	EZ-RNA Reagents	100ml
BS583	EZ-10 Spin Column Bacterial Total RNA Mini-Preps Super Kit	50 Preps
BS91915	EZ-10 Spin Column Fungal RNA Mini-Preps Kit	50 Preps
BS82314	EZ-10 Spin Column Plant RNA Mini-Preps Kit	50 Preps
BS82312	EZ-10 Spin Column Animal Total RNA Extraction Kit	50 Preps
BS82313	EZ-10 Spin Column Blood RNA Mini-Preps Kit	50 Preps
BS88583	EZ-10 Total RNA Mini-prep Kit	50 Preps
BS88583	EZ-10 Total RNA Mini-prep Kit	50 Preps
BS88584	EZ-10 Total RNA Mini-prep Kit	100 Preps
BS88586	EZ-10 Total RNA Mini-prep Kit	250 Preps
BS88254	RNase-Free DNase Set	50 Preps
BS88133	EZ-10 DNAaway RNA Mini-prep Kit	50 Preps
BS88133	EZ-10 DNAaway RNA Mini-prep Kit	250 Preps
MT91928	mRNA Purification Kit from Total RNA	25 Preps