PALL Laboratory

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Protocol

Protocol for Total RNA Purification from Cultured *Escherichia coli* Cells Using Pall Nucleic Acid Binding Nanosep® Centrifugal Device

1. Consumables and Reagents

Table 1

Consumables for Total RNA Purification (nuclease-free consumables are recommended)

Supplier	Product Description	Part Number
Pall Laboratory	Nucleic Acid Binding (NAB) Nanosep Centrifugal Device	76360-454, 76360-456
VWR	Ethanol (not denatured)	71001-866
VWR	Spectrophotometer Cuvettes ~700 µL (260/280 nm)	47743-840
VWR	Tubes 15 mL (RNase-DNase free)	21008-103
VWR	Tubes 50 mL (RNase-DNase free)	21008-178
VWR	Microcentrifuge Tubes 1.5 mL (RNase-DNase free)	76005-210
VWR	Needles (20) (/0.9 mm)	89219-312
VWR	Syringe (10 mL)	89215-218

Table 2

Reagents for Total RNA Purification (nuclease-free reagents are recommended)

Supplier	Product Description	Part Number
Various	TE Buffer (pH 7.5)	N/A
Various	Proteinase K	N/A
Various	DNaseI Set	N/A
Various	Lysis Buffer	N/A
Various	Wash Buffer 1	N/A
Various	Wash Buffer 2	N/A
Various	Nuclease-free Water	N/A
VWR	DTT (25 g)	97063-758
VWR	Lysozyme	97062-136
VWR	Tris Buffer pH 7.0 (1 M)	97062-936

2. Instruments

- Microcentrifuge
- Spectrophotometer
- Vortex

3. Important Points Before Starting

- Clean all equipment/material to be used for RNA extraction.
- All centrifugation steps are performed at room temperature at 10,000 – 14,000 x g.
- It is essential to work quickly and efficiently when working with RNA.
- For each NAB Nanosep device insert there are three receiver tubes. This is enough to complete the below process. Use only the supplied receiver tubes with the NAB Nanosep device.
- All buffers should be allowed to equilibrate to room temperature before use.
- Briefly centrifuge tubes after vortexing to remove drops from inside the lid.
- Change pipette tips between all liquid transfers. Pall recommends use of sterile RNA-free pipette tips.

4. Protocol

1. Estimate the quantity of cells before starting and avoid using cell concentration greater than 5 x 10^7 for *E. coli* culture.
2. From an overnight preculture from a single colony of *E. coli*, inoculate some fresh liquid medium (with antibiotic if relevant) at ~ 1/100. Incubate for around 2 hours to reach an absorbance of 0.5 – 0.8 at 600 nm.
3. Centrifuge at 3,000 x g for 10 minutes to pellet the appropriate number of cells. Remove the supernatant carefully by aspiration.
4. Add 200 µL of Lysozyme/TE solution and 10 µL of proteinase K to resuspend the pellet.
5. Vortex the solution for 10 seconds to mix and incubate at room temperature (20 – 25 °C) on a shaking incubator for 10 minutes. If a shaking incubator is not available, simply stand at room temperature and vortex for 10 seconds every 2 minutes.
6. Add 700 µL of lysis buffer (supplemented with DTT) per tube. Vortex the mixture vigorously.
7. Add 500 µL of 100% non-denatured ethanol to the homogenised lysate. Mix well by pipetting but DO NOT centrifuge.
8. Working quickly, transfer up to 500 µL of the sample to the NAB Nanosep device insert inside a receiver tube, including any precipitate. Close the lid and centrifuge for 60 seconds at 10,000 – 14,000 x g. Discard the flow-through but re-use the collection tube for the next step.
9. Optional DNase digestion steps: (If you do not require DNase digestion step move directly to step 10)
   (See supplier instructions for DNase I preparation)
   a. Add 350 µL of wash buffer 1 to the NAB Nanosep device insert. Close the lid and centrifuge for 60 seconds at 10,000 – 14,000 x g to wash the membrane.
   b. Discard the flow-through and retain the receiver tube for the next step.
   c. Add 80 µL of the prepared DNase I solution directly on to the NAB Nanosep device filter membrane.
   d. Incubate at room temperature for at least 15 minutes.
   e. Add 350 µL wash buffer 1 to the NAB Nanosep device. Close the lid and centrifuge at 10,000 – 14,000 x g for 60 seconds. Discard the flow-through.
10. Wash the NAB Nanosep device membrane with 500 µL of wash buffer 1 and centrifuge for 1 minute at 10,000 – 14,000 x g. Discard the flow through and retain the receiver tube for the next step.

11. Add 500 µL of wash buffer 2 to the spin device, close the lid and centrifuge for 2 minutes at 10,000 – 14,000 x g. Ensure all the solution has passed through the filter membrane. Any residual ethanol will interfere with the downstream reactions.
12. Repeat step 10 but centrifuge for 2 minutes.
13. Carefully remove the NAB Nanosep device insert, being careful not to allow the filtrate to contact the insert, and discard the receiver tube.
14. Place the NAB Nanosep device insert into a clean receiver tube (provided), close the lid and centrifuge for 60 seconds at 10,000 – 14,000 x g.
15. Discard the filtrate tube and place the NAB Nanosep device insert into a clean, weighed receiver tube.
16. Add 50 µL of RNase-free water directly on to the NAB Nanosep device insert filter membrane. Close the lid and incubate at room temperature for 1 minute. Centrifuge for 60 seconds at 10,000 – 14,000 x g to elute the RNA from the filter membrane.
17. Optional:
    a. Repeat the elution step with a further 50 µL RNase-free water in the same device, with the same receiver tube.

Storage of RNA

Purified RNA can be stored in RNase-free water at -20 ºC or -70 °C for 1 year.

Quantification of RNA

RNA concentration can be determined by measuring the absorbance at 260 nm (A_{260}) in a spectrophotometer (see details below). For small quantities of RNA however, it can be difficult to determine these amounts photometrically. Smaller quantities of DNA can be accurately quantified using fluorometric quantification.

Spectrophotometric quantification of RNA

A_{260} readings should be greater than 0.15 to ensure significance. An absorbance reading of 1.0 at 260 nm corresponds to 44 µg of RNA per mL. This is only valid for measurements at neutral pH however. As a result, if it is necessary to dilute the RNA sample, ensure that the dilution buffer is of neutral pH.

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